# *Produce new Iranian rose cultivars with gamma ray*

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## Abstract

Modern breeding methods such as the use of gamma rays to create genetic diversity in flowers and horticultural plants 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, durability and marketability are considered. Rose is one of the most important horticultural crops in the world and as a cut flower has great economical value in the world. Mutation breeding is an established method for crop improvement and has played a major role in the development of many new mutant cultivars. The steps include determining the breeding target, Induced mutations with irradiating the explants (Meristem, leaves, calluses and lateral buds) and tissue culture, dosimetry, propagation, trait stability assessment, environmental compatibility, trait evaluation, selection and introduction.

**Keywords: Genetic diversity, Tissue culture and induced 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 United States [2]. Iran due to its having a variety of climates, can be considered as a leading country in the field of production, marketing and export of flowers and ornamental plants in the region [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 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 yield and quality of different species of flowers and ornamental plants [2,3].

The production of cut flowers of roses is the first in the world. In Iran, with a cultivated area of at least 400 hectares, it is in the first place in the cultivation of the flower industry [2,3]. 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 hectare, high productivity in greenhouse dense cultivation and improving water use efficiency due to the off-season, labor force is cheap and suitable for climate, high light and cheap energy [1-5].

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].

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 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 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 that are propagated by seed or unsexual methods [2,4]. Increase yield, variation, shelf life and Perfume of the flower, as well as increase the plant's resistance to biotic and abiotic stress such as drought, salinity, pests and diseases [2,4].

At present, in the Nuclear Agriculture Research school, some strategic plants that have a potential for currency and income generation 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 roses breeding methods and protocoles.

## *Experimental*

### *Preparation of the materials*

To prepare the explant, Apolo rose rootstocks were prepared from the Ornamental Plants Research Center (OPRC) station of Mahallat and they were stored in phytotrons at 25 ° C and 70-60% of humidity and a light of 7000-6000 lux. appropriate population of samples under the influence of gamma ray with doses of 10-200 Gy was placed in a RCD with 4 replications (5 buds per replication). After 45 days, percentage of survived explants was determined to assess LD50 and morphological traits include growth, viability, height, fresh and dry weight of plantlets were measured [Figure 1 and Table 1]. Initial population production (m0v0) was performed by micropropagation method in MS (Murashige and Skoog medium) with required supplements and hormones. After that, plant buds were irradiated with optimum Gamma ray doses. Plantlet and Buds were cultured in vitro culture [4] for up to three growing generations in the same medium (M1V3). The medium culture was suitable for the mass propagation of roses was MS with the necessary supplements and hormones. For propagation, It was kept at 25˚C for day with 16 hours of light (5,000 lux) and 20˚C with 8 hours of darkness. When each samples are found between 5-12 numbers and can be separated to maturity (about 3 to 5 cm) in the rooting medium (MS without hormone) with 2 g/l of activated charcoal.

The characteristics of regenerated plantlet, were measured. plantlet after producing suitable roots, transferred to pots at high humidity. After the establishment and emergence of new leaves, transferred to greenhouse and were examined under natural conditions in terms of flowering, color, size, number of plants, number of flower branches.

## *Results and discussion*

Mutation induction techniques can increase the frequency of gene mutations, the formation of new germplasm, and cultivars [1-4]. In the past, desirable traits were obtained through classical modification in roses, but there are limitations to these methods. Because the rose gene pool is limited for some traits, crosses are also limited due to incompatibility or differences in ploidy levels between parents [1-3]. mutation breeding of Rose in other countries began many years ago and has achieved great success [2,3].

Figure 2: Mutant (left), Tissue culture and Control samples.

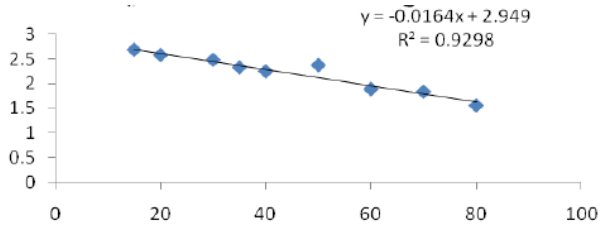


Figure 1: Linear model of height (Y) and gamma ray (X)

| SOV | df | MS (Height) | F |
|---|---|---|---|
| T | 9 | 0.383** | 15.32 |
| Err | 30 | 0.025 | |

**Significant at %١ probability level

Table 1- Analysis of variance in height of irradiated cutting

## *Conclusions*

Appropriate dose for rose irradiation was 40-60 Gy and suitable medium for the mass propagation was MS with the necessary supplements and BAP, and For rooting was without hormone with 2 g/l of activated charcoal. Iran is ranked 17th in flower production and 115th in exports [1-2,5]. Rose bushes will cared until they reach the reproductive stage and selection is based on the desired traits such as no thorns, flowering increase branches, color, form and any suitable trait that is suitable for increasing the marketability. The rose bushes will cutting to produce flowers and re-selection was performed (removal and re-selection is done to remove the chimer and ensure the establishment of the trait) and the plants were selected with the desired traits and cuttings were prepared from them. Finally, evaluations are underway and the new cultivars will be recorded [Figure 2]. For legal registration, they are tested for DUS (Distinctness, Uniformity and Stability).

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