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TOLERANCE OF EDIBLE FLOWERS TO GAMMA IRRADIATION

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ABSTRACT

People have been eating flowers and using them in culinary creations for hundreds of years. Edible flowers are increasingly being used in meals as an ingredient in salads or garnish, entrees, drinks and desserts. The irradiation process is an alternative method that can be used in disinfestation of food and flowers, using doses that do not damage the product. The sensitivity of flowers to irradiation varies from species to species. In the present research was irradiated with doses up to 1 kGy some edible flowers to examine their physical tolerance to gamma-rays. Furthermore, high doses gamma irradiation causes petal withering, browning process and injury in edible flowers.

1. INTRODUCTION

Edible flowers have been used in the culinary arts for flavor and garnish for hundreds of years. Recipes with flowers may be found in the following areas: tea, baking, sauces, jelly, syrup, flavored liquors, vinegars, honey, oil, flower-scented sugars and candied flowers. Some flowers may be dried and used as dried herbs [1]. Many edible flowers are high in vitamin C and/or vitamin A, along with other essential nutrients [2].

Edible flowers are highly perishable product and must be free from diseases and insect pests, which may represent a challenge since edible flowers must be grown without the use of any chemical pesticide [3].

It is important identify new methods for insect disinfestation with minimal damage to the flowers.

Food irradiation is an economically viable technology for the extension of shelf life of perishable commodities, improvement of hygienic quality of foods and disinfestation the insects [4].

The use of irradiation to increase the safety of foods as well to extend their shelf-life has already been proved [5-6-7].

The irradiation technology is a good alternative method to substitute chemical fumigation in disinfestation the insect in food and flowers. Tolerance flower to irradiation varies from species to species [8]

The purpose of this study is evaluating the physical tolerance to gamma-rays some edible flowers: *Borago officinalis, Dianthus chinensis, Viola tricolor, Lobularia maritima* and *Viola odorata* irradiated with doses up to 1 kGy.

2. MATERIAL AND METHODS

2.1. Samples

Samples of *Borago officinalis, Dianthus chinensis, Viola tricolor, Lobularia maritima* and *Viola odorata* were purchased from local market in São Paulo, Brazil. The samples were packaged in polyethylene with five flowers by species.

2.2. Irradiation

The samples were irradiated at Nuclear and Energy Research Institute – IPEN/CNEN (São Paulo, Brazil) using a ^{60}Co Gammacell 200 (MDS Nordion Ottawa, Canadá) at doses of 0, 0.3, 0.6, 0.8. and 1.0kGy.

2.3. Tolerance analysis of edible flowers

In assessing the physical tolerance of edible flowers to the irradiation process were analyzed some undesirable symptoms: change in color darkening, trunk bent, injury, bud opening and inhibition of petal wilting.

The dose considered as minimal was 0.3 kGy for tolerance of the edible flowers and when damaged with 0.3 kGy were as considered as not tolerant.

3. RESULTS AND DISCUSSION

The tolerance analysis (see Table 1) edible flowers irradiated to gamma rays.
Borago officinalis - no tolerant to gamma rays. The dose of 0.3 kGy caused petal withering, opening and fall.
Dianthus chinensis – tolerant to gamma rays. The doses up to 1 kGy no caused the damaging symptom.

Viola tricolor - tolerant to gamma rays. The doses up to 1 kGy no presented the undesirable symptoms.
Viola odorata - tolerant to gamma rays. The doses up to 1 kGy no caused the undesirable symptoms.
Lobularia maritima - tolerant to gamma rays. The doses up to 1 kGy no presented the damaging symptom.

Table 1. Edible flowers tolerance to radiation

Flower	Gamma radiation
Borago officinalis	no tolerant
Dianthus chinensis	tolerant
Viola tricolor	tolerant
Lobularia maritima	tolerant
Viola odorata	tolerant

Studied the sensitivity and tolerance of cut flowers and concluded that there are no visible parameters to establish that the variety of flowers is not tolerant or gamma. The tolerance and sensitivity of cut flowers to irradiation process used for insect disinfestation varies from species to species. [8 -9].
With the absence of an efficient method to classify the radiation sensitivity flowers, is necessary to continue verifying the tolerance of each edible flower

3. CONCLUSIONS

The result shows that gama radiation edible flower *Borago officinali* not tolerant to dose of 0.3 kGy, dose it is necessary to sterilize insects.
The edible flowers *Dianthus chinensis, Viola tricolor, Viola odorata* and *Lobularia maritima* showed tolerance to gamma rays doses up to 1 kGy.

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