

RADIATION TECHNOLOGY TO ENSURE SANITARY QUALITY
OF CUT FLOWERS.

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Abstract

The use of radiation technology for fresh cut flowers disinfestation purpose was proposed. In this work the radiation resistance of three different kind of flowers was evaluated. Rose, carnation and chrysanthemum cut flowers were gamma irradiated with doses of 300 to 900Gy. The results indicated that carnation were the most tolerant up to the dose of 900Gy, without any morphological damage after the treatment and with the same vase-life period of the control samples. On the other hand, irradiated rosebuds did not open even with 300Gy and wilted in this stage of development. The chrysanthemum flowers were relatively resistant to radiation, but their leaves presented an anticipated senescence.

Introduction

The culture of flowers and ornamental plants in Brazil is mainly concentrated in the Southeast of the country and São Paulo state is responsible for 80% of the national market. The Japanese colony contributes with a significant percentage of more than 60% of this production. But the national consumption of flowers is still very low as compared with Japan, USA, Europe and even with other Southamerican countries.

Brazil has a huge diversity of plants and an increasing horticultural development directed to the international trade. The exportation of flowers and ornamental plants includes cut flowers (mainly roses and some chrysanthemums and orchids also), transplantings, begonia and gladiolus bulbs, foliage and others.

Fresh cut flowers for exportation purposes are required to be disinfested to prevent the introduction of new plagues into the importer countries. However, current chemical procedures used for disinfestation are potentially harmful to workers and to the environment. On the other hand, conventional methods are sometimes inefficient because of the flower pattern itself. The irradiation technology for insect control can be an effective treatment for some plants. As the flower is the plant reproduction element relatively sensitive to ionizing radiation, it is important to verify its tolerance to radiodisinfestation doses.

The irradiation of the cut flowers can be performed in cobalt-60 sources^(1,2,3,4) or in electron beam accelerators, as has been investigated by Tanabe and Dohino⁽⁵⁾. The 300Gy minimum dose of ionizing radiation has been considered for quarentenary treatment against mites and insects other than fruit flies⁽⁶⁾. This dose decreases the F₁ generation of aphids, although without significant modification on the survival rate of the irradiated adult insects⁽⁷⁾.

Among commercialized cut flowers some authors described gamma irradiation tolerance up to doses of 500Gy for carnation, gladiolus, freesia, gypsophila and others⁽¹⁾.

The present work aims at the verification of radioresistance of some special kind of exportable flowers as rose, carnation and chrysanthemum.

Materials and Methods

The cut flowers were obtained in the flower market in São Paulo city, the day after harvested and irradiated with doses of 300, 600 and 900Gy in a Gammacell 220 (AECL). They were soaked into distilled water and maintained at room temperature (20-25°C) to observe the morphological changes and the vase-life after the treatment.

Results and Discussion

Table 1 shows the main morphological changes on cut flowers after irradiation.
TABLE 1. Morphological changes on the cut flower after the gamma-irradiation.

flower species	flower modification	leaf modification
carnation	none	none
rose	fail to open, blackening in the insertion region of the petals	none
chrysanthemum	blackening in the insertion region of the petals	yellowing and blackening

Carnation flowers were the most radioresistant, tolerating up to 900Gy of gamma-radiation, confirming the viability of the radiation treatment for disinfestation purposes.

Roses and chrysanthemums suffered some injuries with 300Gy. The rosebuds failed to open after the irradiation, indicating that it would be necessary the administration of some radioprotecting or opening stimulant substance. The petals presented a process of blackening in the insertion region that could be also avoided by radioprotectors or some senescence retarding substance.

Chrysanthemum flowers were relatively radioresistant, but there was an acceleration of leaves senescence. Preservative solutions used normally to extend the vase-life of cut flowers could decrease the radiation damages in leaves, as was described by Haasbroek et al⁽²⁾ on irradiated cut blooms of *Protea compacta* and *Protea longiflora*.

Acknowledgement

The present work was partially supported by Research Contract #6936/RB from the International Atomic Energy Agency - IAEA - Vienna, Austria.

References

1. Wit, A.K.H. and M. Van De Vrie, Gamma radiation for post harvest control of insects and mites in cut flowers. Med Fac. Landbouww. Riksuniv. Gent, v. 50 / 2b, 697-704 (1985).

2. Haasbroek, F.J., G.G. Rousseau and J.F. De Villiers, Effects of gamma-rays on cut blooms of *Protea compacta* R.Br., *Protea longiflora* Lamarck and *Leucospermum cordifolium* Salisb., Ex Knight. Agroplanta v. 5, 33-42 (1973).
3. Chiu, H.T., Control of major insect pests on cut chrysanthemum flowers by gamma radiation. Plant Prot. Bull. v. 28(2), 139-146 (1986).
4. Piriyanthamrong, S., P. Chouvalitvongporn and B. Sudathit, Disinfestation and vase-life extension of orchids by irradiation. In: Radiation Disinfestation of Food and Agricultural Products, James H. Moy, Ed., 222-225. Proceedings of an International Conference, Honolulu, Hawaii, November 14-18, 1983 (1985).
5. Tanabe, K. and T. Dohino, Effects of electron beam irradiation on cut flowers. Res. Bull. Pl. Prot. Japan, 29:1-9 (1993).
6. Heather, N.W. Review of irradiation as a quarantine treatment for insects other than fruit flies. In: Use of Irradiation as a Quarantine Treatment of Food and Agricultural Commodities, International Atomic Energy Agency, Ed., 203-218, Proceedings of the Final Research Co-ordination Meeting, Kuala Lumpur, Malaysia, August 27-31, 1990 (1992).
7. Kikuchi, O.K., N.L. Del Mastro and F.M. Wiendl, Utilização da radiação ionizante para desinfestação de flores de corte. 2 - Irradiação de pulgões (Homoptera: Aphididae). Anais do V Congresso Geral de Energia Nuclear, vol. III: 837-839 (1994).