CUT FLOWERS DISINFESTATION BY IONIZING RADIATION. 3. PRESERVATIVE SOLUTION TREATMENT OF ROSES.

Olivia Kimiko Kikuchi
Nelida Lucia Del Mastro
Frederico Maximiliano Wiendl*

Instituto de Pesquisas Energéticas e Nucleares (IPEN - CNEN / SP)
Caixa Postal 11049
05422-970, São Paulo, SP

*Centro de Energia Nuclear na Agricultura (CENA / USP)
Caixa Postal 96
13400-970, Piracicaba, SP

ABSTRACT

Cut flowers and ornamental plants are fresh produce that have to be submitted to a quarentenary treatment before export to countries where the sanitary inspection is rigid. The ionizing radiation is an effective disinfestation procedure that neither contaminates the environment nor the people who handle the treated products. Besides, the irradiated insects do not acquire resistance as it happens with chemical treatments. This paper presents the results from laboratorial gamma irradiation processing of some mini-rose varieties, normally traded in Brazil. Rosebuds were irradiated in a Gammacell 220 with a single dose of 900 Gy. As the irradiation can accelerate flowers and leaves senescence and inhibit buds opening, conventional preservative solutions of aluminum or hydroxyquinoline sulfate were administered to the cut flowers. The irradiated buds did not open and the preservative solutions failed to promote opening, although the stems were soaked before and after irradiation. The preservative treated flowers maintained the vigor for a period longer than that for the controls and the irradiated ones.

INTRODUCTION AND LITERATURE REVIEW

Roses are the most widely commercialized cut flowers in the world. There are a large variety of roses that can be chosen by colour, size, and number of petals. Most of these varieties has been the result of man made crossings and alterations, a practice that continues. Roses have to be harvested as buds and their vase-life is relatively short, mainly if the room temperature is high. So, the storage of that fresh produce requires special practices whenever they have to be transported after harvest by truck or by plane. Besides, the fitossanitary requirements of many importing countries are very rigid in order to avoid the introduction of new or already eradicated pests. Irradiation is a very powerful disinfestation procedure, widely used on fruits and vegetables, also to improve their storage life. However, gamma irradiated rosebuds can be damaged at doses as low as 100 Gy [1]. The most evident symptom of damage is bud opening failure. As the required dose to guarantee the sterility of the majority of insects is around 300 Gy [2], it would be necessary to find a way to minimize radiation induced damages. Preservative solutions used to improve vase-life of cut flowers can be efficient against radiation deleterious effects too. They were effective for gamma irradiated *Protea* cut blooms [3] and chrysanthemum flowers [4, 5]. Unfortunately, floral preservative solutions are not commonly commercialized in Brazil. Recently, a product named "Chrysal" from the Netherlands could be obtained from an exportation dealer, but the costs are still very high mainly to the small producer. In opposition, in Japan there are, at least, four floral preservatives commonly commercialized: "Fresh Keep Flowers", "Hyponex", "Florist", and "Chrysal". These products are widely used by producers, florists and final consumers to extend the vase life of their flowers.

This paper presents the results obtained after gamma irradiation processing of three varieties of mini-rose during their vase-life period, using two different preservative solutions.

MATERIALS AND METHODS

Three varieties of mini-rose were employed: "Rosa", "Mambo" and "Champagne". They were obtained one day after harvest coming from regions like Atibaia and Guararema (about 150 to 200 km away from São Paulo). Their stems were cut to approximately 15 cm, and distributed as follows: **Control** - soaked into distilled water; **900 Gy** - irradiated and soaked into distilled water (this dose of 900 Gy was chosen because a factor of about three times the necessary sterilizing dose of insects was considered sufficient as a security factor); **900 Gy + AlSO4** - irradiated and soaked into aluminum sulfate preservative solution; **900 Gy + 8-HQ** - irradiated and soaked into 8-hydroxyquinoline sulfate preservative solution; **AlSO4** - soaked into aluminum sulfate preservative solution; **8-HQ** - soaked into 8-hydroxyquinoline preservative solution. Each group was composed by ten buds. They were soaked into distilled water or preservative solution during four hours before irradiation. The preservatives were composed of: <u>aluminum sulfate solution</u>, modified from Haasbroek [3] : 0.025% maleic hydrazide, 0.001% aluminum sulfate, 0.01% citric acid, 0.01% hydrazide sulfate, 2% sucrose, 0.0025% silver nitrate; <u>hydroxyquinoline sulfate solution</u> : 0.01% 8-hydroxyquinoline sulfate, 2% sucrose, 0.01% citric acid, 0.0025% silver nitrate. The bud irradiation was performed within a Cobalt-60 Gammacell 220 source, with a dose of 900 Gy at a dose rate of 472 Gy/hour, without any solution. After irradiation the buds were soaked again. During the experiments the room temperature varied from 20 to 25° C, and the relative humidity from 65 to 75%.

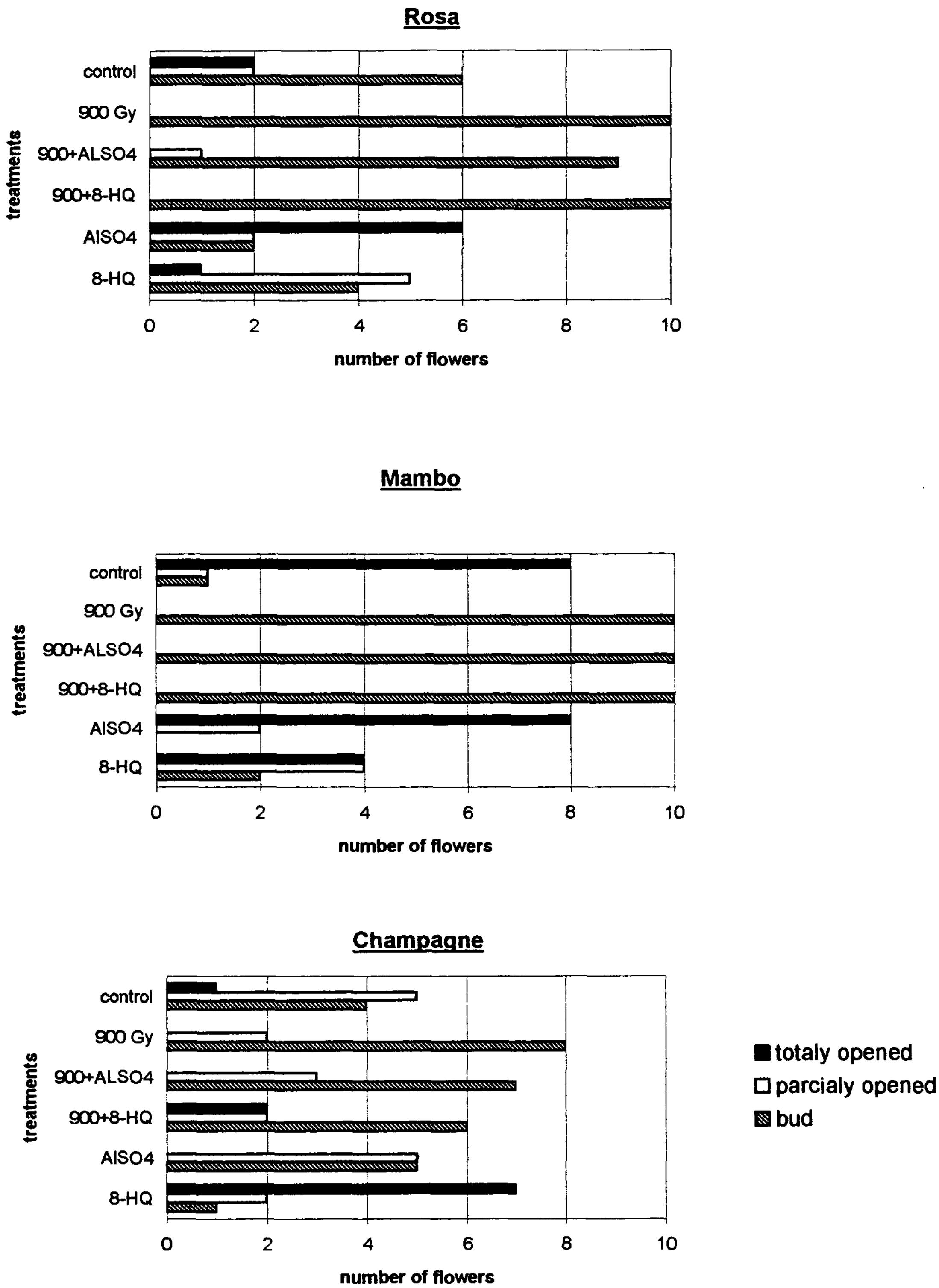

Figure 1. Mini-roses Development Stage at the End of the Vase-life.

RESULTS AND DISCUSSION

Figure 1 shows the mini-roses development considering the several treatments. The two preservative solutions failed to promote the opening of irradiated buds, although the stems were soaked before and after irradiation. Almost all the roses of the "Mambo" variety control group opened totally. Unlike "Mambo" variety, "Rosa" and "Champagne" varieties continued as buds or opened only partially. According to the growers, the variety "Mambo" is in fact known by opening completely the most part of its buds, and this is not the case of the other two varieties.

The two preservative solutions were efficient to maintain the flower vigor longer than the controls and the 900 Gy irradiated ones. However, the vase-life did not vary in a significant way. It seems that the exogenous sugar supply was responsible for the rapid opening of the buds. The ideal results would be obtained by the delay of the buds opening by irradiation, because the preservative solutions would prevent the damaging effects of the radiations.

Physiologically, flowers suffer a stress when they are cut off from their roots or stems [6, 7]. The deterioration and the senescence processes occur quickly and even a preservative solution supply is not enough to maintain flower vigor as long as in the intact plant itself. When irradiated, the cut flower suffers the oxidative stress produced by radiation induced free radicals. Also it must be taken into account that fresh cut flowers contain a high content of water, whose radiolysis is responsible for all indirect cell damages. It was observed (unpublished data) that when wet roses were irradiated, the petals presented burning areas, probably where the water drops were situated.

The ordinary flower preservatives were not effective against the radiation damages on roses, submitted to the dose of 900 Gy. As the free radicals production also occurs during the normal senescence process in the plants [8, 9] and the ionizing radiation can accelerate this phenomenon, we are encouraged to continue the investigations using radical scavengers.

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