

# IMPEDANCE MEASUREMENT OF GAMMA-IRRADIATED CHRYSANTHEMUM HEAD

Olivia Kimiko Kikuchi\*, Setsuko Todoriki\*\*, Kazuhiko Nakahara\*\*,  
Frederico Maximiliano Wiendl\* and Toru Hayashi\*\*

\*Instituto de Pesquisas Energéticas e Nucleares -IPEN-CNEN /SP  
Caixa Postal 11049  
05422-970, São Paulo, SP, Brasil

\*\*National Food Research Institute - NFRI-MAFF  
2-1-2 Kannondai, Tsukuba, Ibaraki 305, Japan

## ABSTRACT

The electrical conductivity or impedance can be used to determine the changes occurred at membrane level of the plant tissues, during the senescence process or after a stress condition. Chrysanthemum cut inflorescences were irradiated with a single dose of 750Gy in a Gammacell 220. The experiment was constituted by four groups: control, non-irradiated samples; irradiated samples; non-irradiated and 2% sucrose supplied samples, and; irradiated and 2% sucrose supplied samples. The measurements were carried out during the flower vase-life with a Digital Spectral Analyzer. The radiation inhibited the development of the flowers, which could be avoided by the sucrose. An increase in the inflorescence head impedance was detected soon after the irradiation, indicating that the dose of 750Gy caused changes at membrane level.

## I. INTRODUCTION

Fresh cut flowers, mainly from tropical countries, are frequently infested by many kinds of insects. Any egg, larva, pupa or adult insect have to be eliminated or sterilized to avoid their introduction in the importer country. The irradiation can be an effective procedure for fresh products disinfestation purposes. However, it is important to estimate the tolerance of these fresh products to the disinfesting doses of radiation. The electrical impedance measurements in plant tissues have been applied to detect the cell membrane changes caused by the environmental or mechanical stress [1, 2, 3] and during the fruit ripening [4]. The method has been also used to the detection of irradiated potatoes [5, 6]. In this work we present the electrical impedance measurements of the chrysanthemum head, after the inflorescence gamma-irradiation with 750Gy.

## II. MATERIAL AND METHODS

Plant material. White chrysanthemum cut inflorescences (*Dendranthema grandiflorum* Kitamura) were purchased in a local florist, in Tsukuba city, Japan.

Preservative solution. 0.02% (w/v) 8-hydroxyquinoline sulfate, 0.01% (w/v) ampicillin and 0.01% (w/v) streptomycin.

Inflorescence irradiation and storage. The stem, with the inflorescence, were cut to 20cm, just before the irradiation with a single dose of 750Gy (3kGy.h<sup>-1</sup>) in a Gammacell 220 (Nordion, Intl., Ont., Canada). The samples were divided into four groups: C - control, non-irradiated samples; I - irradiated samples; S - non-irradiated and 2% sucrose supplied samples, and; IS - irradiated and 2% sucrose supplied samples.

Impedance measurement. The chrysanthemum flowers were picked out from the head, which was punctured with the steel electrodes connected to a Digital Spectral Analyzer TR9403 (Advantest Ltd., Japan).

### III. RESULT AND DISCUSSION

Fig.1 shows that the impedance of irradiated chrysanthemum heads ( I and IS ) increased immediately after the irradiation, staying higher than the non-irradiated samples for 11 days. When the inflorescences were wilting and losing the commercial viability, the impedance decreased, as was observed in control ( C ) and irradiated ( I ) samples, 25 days after the irradiation.

In previous works we observed that the development of chrysanthemum flowers was inhibited by the irradiation, while the sucrose supply during the vase-life protected the inflorescences against the radiation deleterious effects [7, 8]. The sucrose also extended the vase-life of irradiated inflorescences which continued to grow, in spite of the impedance alteration.

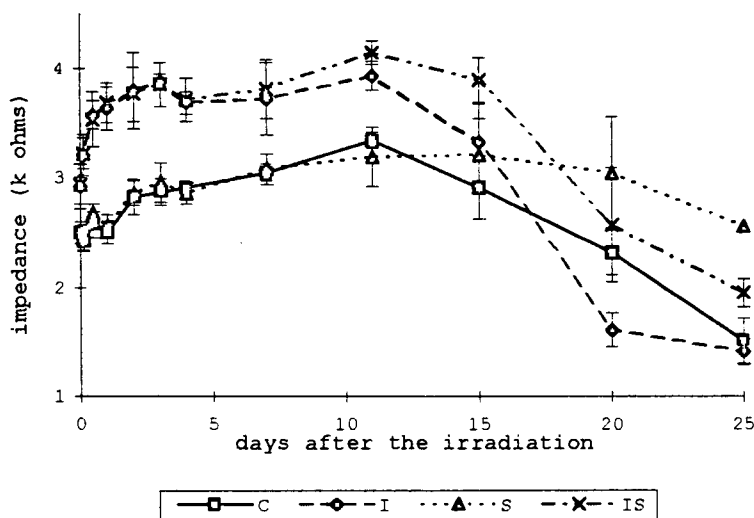


Figure 1. Electrical impedance measurement of the chrysanthemum head, after gamma-irradiation with 750Gy. C - control; I - 750Gy; S - non-irradiated, supplied with sucrose; IS - irradiated with 750Gy and supplied with sucrose.

Severe stresses such as high temperatures can be detected by electrical impedance decrease in plant tissues [3]. Our results indicated that the dose of 750Gy was not enough to induce an immediate injury due to radiation stress which could be detected by this method. The increase on membrane impedance soon after the irradiation suggests that the inhibition of the inflorescence development caused by 750Gy is associated with other biological parameters.

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