ELECTRON BEAM DISINFESTATION OF CUT FLOWERS

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The present research report relates data obtained with electron beam irradiation of cut flowers and their pests.

Susceptibilities of seven species of pests (Tetranychus urticae, Pseudococcus comstocki, Thrips palmi, Thrips tabaci, Liriomyza trifolii, Spodoptera litura and Myzus persicae) to elecrton beams were investigated. Electron beam irradiation at 400 Gy provided the inhibition of hatching, larval growth, pupation, adult emergence and / or oviposition and sterilized the adults or their progeny. Our results suggest that, irrespective of the species and stages of the pest, 400 Gy-irradiation is the general minimum dose for inactivation of pests for cut flowers (Table 1). However, there is a new problem ahead of irradiation treatment that the sterile pest (M. persicae) has still virus (PLRV) transmission ability.

Carnation, alstromeria, gladiolus, tulip, statice, stock, dendrobium, prairie gentian, oncidium, campanula, gloriosa, fern, gypsophila, freesia, lobelia, triteleia and gerbera were tolerant to electron beams at 400 Gy, while chrysanthemum, rose, lily, calla, antherium, sweet pea and iris were intolerant (Table 2). Commercial floral preservative solutions or sugar solutions (2%) as the post-irradiation treatment reduced radiation-induced deterioration in the quality of chrysanthemum, which was the most susceptible to irradiation.

The penetration capacities between accelerated electrons and X-rays were measured in the cartons with various densities (0.06, 0.15, 0.23, 0.25g/cm3) of chrysanthemum flowers. X-rays would be preferable to electron beams for treating cut flowers for quarantine treatment although electron beams would be applied to cartons with low density such as 0.06g/m3. However, technology to irradiate products continuously for a long period with X-rays has not been established.

Table 1 Susceptibilities of pests to electron beams

Species	Stage	100Gy	200Gy	400Gy	600Gy
Two spotted spider mite	egg			0	0
Tetranychus urticae	larva & nymph			0	0
	adult			x	0
0					
Comstock mealybug	egg		0	"	"
Pseudococcus comstocki	larva		0	0	0
	Adult		×	0	0
American serpentine					
leaf miner	egg				
Liriomyza trifolii	larva				
	pupa				
Species	Stage	100Gy	200Gy	400Gy	600Gy
Thrips	egg				
Thrips palmi,	larva	0	0	0	
T. tabaci	adult	×	×	0	
Tobacco cutworm	egg				
Spodoptera litura	larva				
Green peach aphid	nymph & adult		0	0	0
Myzus persicae					

; dead, inhibition of adult emergence, 0 ; sterilized, × ; no effect

Table 2 Tolerance of cut flowers to electrom beams

Tolerance	Carnation, Alstromeria, Gladiolus, Tulip, Statice, Stock, Dendrobium, Prairie gentian, Oncidium, Campanula, Gloriosa, Fern, Gypspphila,
	Freesia, Lobelia, Triteleia, Gerbera
Intolerance	Chrysanthemum (flowering wilting, browning of inflorence core, etc.)
	Rose (delay and inhibition of flowering, foliage yellowing)
	Lily (delay and inhibition of flowering, withering of petals, etc.)
	Calla (browning ob bract leaf, petiole bending)
	Antherium (withering of bract leaf)
	Sweet pea (abscission of flower)
	Iris (foliage yellowing, necrosis of bud edge)

Adverse effects are described in parentheses.