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Irradiation to delay ripening

Bananas

In general, to delay ripening 0.30-0.35 kGy as minimum dose would be required (1). This dose range is from the laboratory where everything is much more under control than in a production environment. It has been established that the location of the fruit in the container determines the dose it gets. The end result is not a container with a uniformly irradiated product. If a minimum dose of 0.30 kGy is needed, then you end up with an actual dose range of 0.30 - 0.65 kGy (2). So, how do bananas cope? It again depends on the variety.

* Indian research checked out 5 varieties of commercial importance.

Giant and Dwarf Cavendish could tolerate up to 40 kGy. Fill Basket tolerate up to 0.35 kGy; Red could tolerate up to 0.50kGy and French Plantain could tolerate up to 0.30 kGy (3)

* American research found that 'their banana' (no variety mentioned) could tolerate 0.50 kGy (1)



* Canadian research found that the variety gros Michel from Honduras could tolerate 0.50 kGy and higher and that lower doses had hardly any effect on ripening (4)

So in practice the dose range to delay ripening would be too narrow for successful treatment. Not only that you scramble up your carefully selected and graded product, but you end up with bananas in various stages of ripening within one container. Some bananas got insufficient irradiation and start ripening anyhow, other bananas got the right dosage and are delayed in ripening and again other bananas got over exposed and become soft and mushy and will be severely damaged in transit.

Pears

According to one report pears can in general tolerate a dose of around 1 kGy. But 2.5 kGy would be needed for successful delay of ripening (1).

* Bartlett pears irradiated with 1 and 2 kGy resulted in a delay in ripening of 2 days if ripening came with ethylene production. This ripening was then normal, while irradiation with 3 and 4 kGy resulted in abnormal ripening. The pears remained green, failed to soften and were insipid in flavour. Timing was very important as only mature but unripe pears responded well to the treatment. Once ripening had started it continued regardless of irradiation (5).

* The Leconte variety from Lahore could still be successfully irradiated when slightly unripe. With 2 and 3 kGy ripening was delayed for 2 or 3 days. With higher doses the surface of the pears began to decay while still green after 11 days (6).

Is a delay in ripening of 2 or 3 days worth the effort? How much time would the irradiation treatment take plus transport to and from the irradiator?

Apples

Apples are irradiated to suppress scald and brown core.

According to one report the maximum tolerated dose for apples is about 1.5 kGy. The suppression of scald requires 1.5 kGy as well. As this would be an overall average dose it is clear that many apples would be unacceptably damaged (1).

•According to another report McIntosh, Cortland and Rome Beauty apples showed tissue softening within 24 hours of irradiation with 0.10 kGy.

In McIntosh a dose of 0.50 kGy resulted in some skin injury as hard wrinkled, sunken patches on the green portions of the skin.

The Cortlands had a flat taste lacking their typical flavour and irradiated with 1 kGy resulted in an alcoholic or off-flavour. Also, irradiation results varied according to the time of picking (7)

References

1. Maxie, E.C. et al. 1971. Infeasibility of irradiating fresh fruit and vegetables. HortScience 6(3): 202-204
2. Boag, T.S. 1987. Evidence given to the Standing Committee on Environment and Conservation of the House of Representatives. Hansard p. 2229.
3. Thomas, P. et al. 1971. Effect of gamma irradiation on the postharvest physiology of five banana varieties grown in India. J. food Sci. 36: 243-247.
4. Ferguson, W.E. et al. 1966. The effects of gamma irradiation on bananas. Food Technology 20: 105-107.
5. Maxie, E.C. et al. 1966. Food Irradiation: Physiology of fruits as related to feasibility of the technology. Advances in Food Research 15: 105-145.
6. Sattar, A. et al. 1971. Effect of gamma radiation on post-harvest behaviour of pears. Science & Industry 8(3/4): 330-333
7. Massey, L.M. et al. 1964. Some effects of gamma radiation on the keeping quality of apples. Agric. and Food Chem. 12 (3): 268-274.