

## RESEARCH NOTES

### EFFECT OF $\gamma$ IRRADIATION ON LEMON OIL AND LEMON-GRASS OIL<sup>1</sup>

The gamma irradiation of foodstuffs for their preservation can affect their flavor.<sup>2</sup> Some of the off-flavor may be due to the radiolytic decomposition of the natural essences. A number of essential oils were irradiated with  $\gamma$  radiation or electrons up to doses of  $10^7$  rads<sup>3,4</sup>, but no changes were found in the density or specific rotation of the oils. However, an improvement in the odor of citrus oils was noted due to the reduction in the terpenic content.

The radiolysis of citral and citronellal, the major constituents of lemon oil and lemon-grass oil, have now been studied.<sup>5</sup> The samples were sealed in evacuated tubes and irradiated with cobalt-60  $\gamma$  source to doses of 14 megarads. The irradiated samples were analyzed by vapor-phase chromatography on a 6-foot column of 5-percent neopentylglycol succinate on gas chrom 2 support, at 125°. Citrol, citronellol, geranic acid, dihydrogeranic acid or cyclocitral were not detected in the radiolysis products. No gaseous products, such as hydrogen, carbon monoxide, or methane, were found by gas-phase chromatography using a silica-gel column. The only product detected was polymer. The  $G_{-M}$  value (number of molecules destroyed per 100 electron-volts of energy absorbed) was 19.6 for citral and 21.7 for citronellal. This may be compared with a recently reported  $G_{-M}$  value for oleic acid of 17.<sup>6</sup>

Citral and citronellal were also radiolyzed in 0.8 M aqueous acetic acid, to better simulate their occurrence in the essential oils of the fruits. In aqueous medium the radiation is absorbed by the water resulting in the formation of hydroxyl radicals. No products other than polymers were found. The  $G_{-M}$  values for citral and citronellal were 4.8 and 6.5, respectively, showing that they are resistant to attack of hydroxyl radicals.

It can be concluded that, although citral and citronellal, undergo radioly-

<sup>1</sup> This work was initiated during the Atoms in Action Exhibit of the U.S. Atomic Energy Commission in Guatemala City, August, 1965. Thanks are due to the Asociación de Productores de Aceites Esenciales de Guatemala for a gift of essential oils.

<sup>2</sup> Hannan, R. S., Food Investigation Special Report, No. 61, DSIR (London), 1955.

<sup>3</sup> Hills, P. R., Petley, P. T., and Roberts, R., *Perfumery Essent. Oil Rec.* 52: 413-16, 1961.

<sup>4</sup> Fazakerley, H., Garratt, P. G., Hills, P. R., and Roberts, R., *Int. J. Appl. Rad. Isotopes*, 11: 174-83, 1961.

<sup>5</sup> Wheeler, O. H. and Osborne, E. D., *Int. J. Appl. Rad. Isotopes*, (in press).

<sup>6</sup> Howton, D. R. and Wu, G. S., *J. Amer. Chem. Soc.* 89: 516-22, 1966.

sis, this would not affect the flavor of oils containing these compounds, since they polymerize and do not form other volatile components.

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