Investigations on Rumple of Lemon

G. TERRANOVA and A. SCUDERI

RUMPLE, A DISORDER of lemon fruit, is of unknown etiology. It was reported first in Florida (1, 2, 4) but has been known to Sicilian growers for a long time as "mangiato d'agro," more recently as "raggrinzimento della buccia" (3, 5, 6, 7, 8). Rumple resembles impietratura in several ways, particularly in that the percentage of fruit affected varies not only from year to year but also with different blooms. Consequently, we have been investigating the possibility of rumple being a virus disease.

The characteristic symptoms of rumple are wrinkling of the fruit and chlorotic spots on the rind, in which the oil glands stand out prominently. The spots later become brown, firm, and filled with gum, which penetrates deeply into the albedo (2, 6). Directly underneath the spot, the albedo becomes snow white. Many of the fruit have gum in the albedo, most frequently under the calyx, sometimes in the columella, and less frequently in areas of the peel that have no external symptoms.

Experimental Work

We examined many fruit from different blooms of nucellar line trees: 18 Monachello lemon trees; 7 Femminello, 12–16 years old; and 15 Femminello Continella, 6 years old. All the nucellar trees were growing in orchards in which old line lemon trees were also growing.

Rumpled fruit were observed only on the old line trees; the fruit of nucellar trees were symptomless. Thus, there is reason to believe that there is no relation between rumple and pedoclimatic or nutritional conditions.

In spring 1967, 3 lemon trees, each a different variety from different areas, were used as a source of inoculum to inoculate 6 grapefruit trees—3 nucellar and 3 old line—growing on sour orange rootstock. The source plants were: a Femminello di Siracusa lemon tree growing in a field at Arenella, Siracusa; a Femminello Comune lemon tree in a field at S. Maria La Strada, Catania; and a Monachello lemon tree at the Citrus Experiment Institute, Acireale. One nucellar index plant and 1 old line plant were kept without inoculation as controls.

In spring 1968, budwood from the same source trees was used to inoculate 3 nucellar lemon trees, 1 tree for each source.

The fruit of the inoculated nucellar and old line grapefruit trees had gum impregnation in the albedo in the fall of 1967, 1968, and 1969. Only those nucellar lemon trees inoculated with Giarre and Acireale sources produced a few fruit with

slight gum impregnation in December 1968.

Discussion and Conclusions

Although the cause of rumple has not been determined, the results serve to indicate the following: 1. the variability in incidence of fruit affected by rumple is analogous to that of impietratura; 2. gum is present in the albedo and in the columella of fruit affected by each of these diseases; 3. nucellar lemon trees did not develop rumpled fruit; 4. mild symptoms resembling those of impietratura appeared on all grapefruit trees inoculated with material from a rumple-affected tree and on the fruit of 2 of the 3 inoculated nucellar lemon trees.

The results also show that all 3 of the rumple-affected trees indexed are carriers of impietratura virus. The evidence reported in this paper gives reason to believe that there may be a relationship between impietratura virus and the presumed causal agent of rumple.

Literature Cited

1. KNORR, L. C. 1958. Finding the best lemon for Florida—a report of progress. I. The growing of lemons in Florida: historical, varietal, and cultural considerations. Proc. Florida State Hort. Soc. 71: 123–28.
2. KNORR, L. C. 1963. Rumple—a new disease of lemon fruits. Plant Disease Reptr. 47: 335–39.
3. KNORR, L. C., and KOO, R. C. J. 1968. Rumple—a serious rind collapse of lemons in Florida and in Mediterranean countries, p. 1463–72. *In* H. D. Chapman (ed.), Proc. 1st Intern. Citrus Symp. Vol. 3. Univ. Calif., Riverside.
4. OBERBACHER, M. F., and KNORR, L. C. 1965. Increase of rumple and decay in lemon fruits during storage. Proc. Am. Soc. Hort. Sci. 86.
5. RUSSO, F., and KLOTZ, L. J. 1963. Wrinkle rind of lemons in Sicily. Calif. Citrograph 48: 7, 264.
6. SALERNO, M. 1963. Il "Raggrinzimento della buccia" grave alterazione dei frutti di limone. Tecnica Agricola 15: 507–11.
7. SALERNO, M., and CONTINELLA, G. 1967. Ricerche sul "Raggrinzimento della buccia" in relazione alla diversa sensibilita di alcune selezioni di cultivar di limone. Tecnica Agricola 19: 340–54.
8. SCARAMUZZI, G. 1965. Le malattie degli agrumi. Edizioni Agricole (Bologna), p. 167.