A Quantitative Hardness Tester for Food Products[1]

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A pressure-hardness tester has been designed by the writer and fabricated by machinists of the Division of Industrial Research to supply a quantitative method for testing hardness of fruits and other food products, replacing the qualitative "thumbnail" or "finger pressure" method. At present the device (Fig. 1) is being used to test hardness of pears in conjunction with a research project jointly sponsored by the Northwest Canners Association, Washington State Soft Fruit Commission and the Division of Horticulture, State College of Washington.

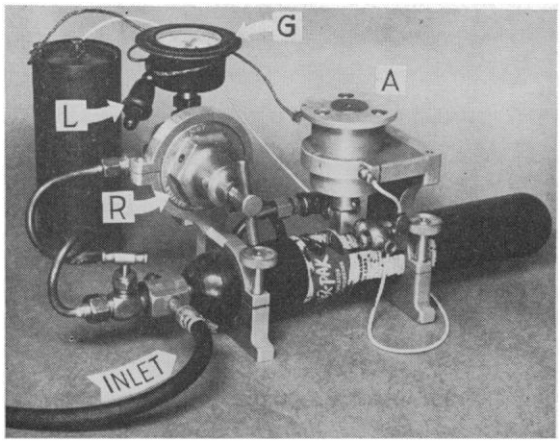

FIG. 1. Photograph of a quantitative hardness tester. Small tank not necessary when tester is connected to external source of gas pressure. Corresponding parts lettered as in Fig. 2.

The principle of the tester is the determination of that gas pressure necessary to force the blunt end of a piston a very small but fixed distance into the test material.[2] The tester now in use forces a rounded brass tip 5/32" in diameter 1/32" into the pear. The top plate serves both as a stop, restricting penetration to 1/32", and as an electrical contact, completing a circuit which lights an indicator lamp when maximum penetration is reached. Pressures found necessary to effect this penetration into normal green pears have been observed to vary from 50 to 65 pounds per square inch. Abnormally hard pears were found to test above 65. Tips of others sizes and penetrations of different depths may be used for other food products. Any convenient and suitable gas source may be used, such as compressed air or nitrogen.

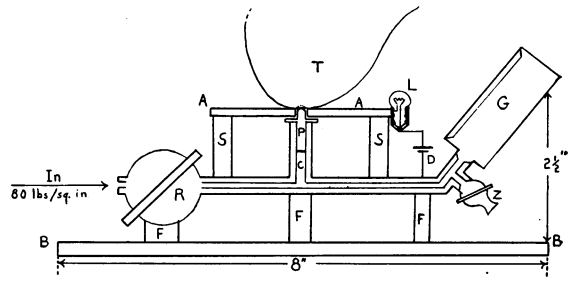

FIG. 2. Sketch of device shown in photograph. A—top plate; B—base plate; C—cylinder; D—dry cell battery; F—metal frame; G—pressure gauge; L—indicator amp; P—piston; R—regulator valve; S—insulated support; T—test fruit; Z—release petcock.

Fig. 2 shows a simplified sketch of the tester, illustrating its basic operating principles. Future models will be constructed from this design.

No injury to the fruit is apparent or expected from this test. Pears are held firmly against top plate during the test, a barely visible indention being the only effect.

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[2] A tester utilizing mechanical pressure from a spring was also designed and may be fabricated for later work. The writer is grateful to Prof. N. S. Golding for supplying a metal hypodermic cylinder body and piston and for suggestions concerning its use.

The Properties of the Enzyme-Substrate Compounds of Horse-Radish and Lacto-Peroxidase[1]

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Peroxidases are iron-containing enzymes which, on the basis of both spectroscopic and magnetic susceptibility data, form definite chemical compounds with their substrate, hydrogen peroxide. These enzyme-substrate compounds cause the very rapid oxidation of oxidizable substances (acceptors) such as ascorbic acid, pyrogallol, etc. One type of peroxidase is widely distributed in plants and is usually prepared from horse-radish root (horse-radish peroxidase). Another type is found in milk and is called lactoperoxidase. The pioneer work of Keilin and Mann (*10*) on horse-radish peroxidase and Theorell's (*16*) purification and extensive studies of both horse-radish and lactoperoxidase now make it possible to study in detail the properties of the several compounds which these enzymes form with hydrogen peroxide and the mechanism by which these compounds oxidize acceptors.

[1] The horse-radish peroxidase, lactoperoxidase, and cytochrome C preparations used in these studies were generously supplied by Hugo Theorell and K. G. Paul. Many thanks are due to H. Theorell, D. Keilin, and E. F. Hartree for their criticism and advice in these researches. A special acknowledgment is made to the memory of Glenn Millikan, who greatly stimulated this development of the rapid-flow method for studies of enzyme-substrate compounds.

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