

pressing solids. The equation used to compute PE units per g. of soluble solids is:

$$(\text{PE.u.})\text{g. soluble solids} = \frac{\text{ml. sodium hydroxide} \times \text{mormality}}{\text{weight of sample} \times 30 \text{ min.} \times \frac{^\circ\text{Brix}}{100}}$$

### PECTIC SUBSTANCES

**Reagents for Pectic Substances.**—Ethyl alcohol, reagent grade, 95 percent.

Ethyl alcohol, ca. 63 percent. Add 1 volume of distilled water to 2 volumes of reagent grade 95 percent ethyl alcohol.

Ethyl alcohol, purified. Reflux 1 liter of 95 percent reagent grade ethyl alcohol with 4 g. of zinc dust and 2 ml. concentrated sulfuric acid for 24 hr. Distill, using all-glass apparatus. Redistill from zinc dust and potassium hydroxide, using 4 g. of each to 1 liter of alcohol.

Ammonium oxalate, reagent grade, 0.75 percent solution.

Sodium hydroxide, reagent grade, 1N. Forty g. sodium hydroxide dissolved in 1,000 ml. water.

Sulfuric acid, reagent grade, concentrated. Reject lots of acid that give a color when added to carbazole solution.

Carbazole, 0.1 percent alcoholic solution. Dissolve 0.1 g. of reagent grade carbazole in purified ethyl alcohol and dilute to 100 ml. A blank of 1 ml. of water, 0.5 ml. of carbazole solution, and 6 ml. of sulfuric acid carried through the entire procedure should be water-white or nearly so.

Galacturonic acid monohydrate, reagent grade. Check the purity by titrating 0.5 g. with 0.1N sodium hydroxide to pH 8.0. The theoretical molecular weight of galacturonic acid hydrate is 212.

**Extraction of Pectic Substances.**—The pectic substances are divided into three fractions by progressive extractions with distilled water, 0.75 percent ammonium oxalate and 0.05N sodium hydroxide. All separations are made by centrifugation followed by decantation.

Purification and extraction procedures require approximately three hr. and the colorimetric determination of anhydrogalacturonic acid takes about 20 min. Duplicate samples carried through the extraction and colorimetric procedures should agree within 5 percent.

Citrus juice or concentrate is comminuted for three min. in an Osterizer or similar blender. Weigh 16 g. of juice or 4 g. of concentrate into a tared 50 ml., graduated, short conical bottom,