lemons. The trees were sprayed with either a 2-percent urea solution, or a 0.2-percent biuret solution, or a combination of the two. Yellow-tip resulted from the sprays of pelletized urea, from biuret, and from the biuret-crystal urea combination but not from the crystal urea.

A second experiment was made with the same type of young budded trees, but the urea and biuret solutions were applied to the soil. The treatments consisted of 50 ml of either 2-percent urea, or 0.2-percent biuret, or a combination of the two applied to each 1-gal can (Fig. 2). Yellow-tip resulted from all treatments containing biuret but not from crystalline urea. In both the spray applications and the soil applications, more severe yellow-tip resulted from the combination of urea with biuret than from biuret alone, although yellow-tip occurred in both instances.

The results reported indicate that biuret is a material in commercial ureas that induces leaf yellow-tip of citrus from either foliage or soil applications.

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Investigation of the Reported Toxicity to Rats of *Gliricidia sepium,* Jacq.

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It has been reported (*1–3*) that the plant *Gliricidia sepium,* Jacq. is toxic to rodents. In fact, the Latin name *Gliricidia* means "rodent poison" (*4*). However, no pharmacologic investigation of this plant has ever been made to substantiate or disprove these claims. This is the purpose of this investigation.

The dried plant material, with the exception of the roots used in this study was collected by Barbara Norby in Quizzaro de San Jose, Costa Rica (*5*). Identification of the plant was by Mrs. Norby and Alexander F. Skutch. It was air-dried in Costa Rica before shipment.

The fresh leaves used in this investigation were from 40 plants grown for 2 yr in our pharmacy greenhouse. The seeds were obtained from the plant collections of Mrs. Norby. The roots used were the oven-dried roots of the 2-yr-old, greenhouse-grown plants.

The plant material was prepared for toxicity tests as follows: (i) The dried, mature leaves, young leaves, seeds, fruits, and roots were ground to a No. 60 powder. (ii) To concentrate the constituents of the leaves, 90 g of the dried, young leaves was successively and totally extracted in a Soxhlet extractor with petroleum ether, ether, and chloroform. The marc from the chloroform extraction was dried and then boiled with 1500 ml of absolute alcohol. An additional 300 ml was added after ½ hr of boiling. The marc from this extraction was treated as the previous one, using 70 percent alcohol instead of absolute alcohol. The remaining marc was subsequently extracted in a Soxhlet using distilled water. The solvents containing the extractive from these extractions were evaporated, and the residues were used in the toxicity studies. (iii) Entire, fresh, compound leaves were mixed in a Waring Blendor with 230 ml of distilled water to a puree consistency. To remove fibrous material, the mixture was strained through a single thickness of cheesecloth.

For comparison of dosage, moisture determinations were made of fresh leaves and the young dried leaves. The fresh leaves had an average moisture content of 79.5 percent; the young dried leaves, 4.5 percent.

The study of the toxicity of *Gliricidia sepium,* Jacq. was divided into four parts. One hundred thirty-five mature albino rats were used in the study, and control groups were maintained for each portion of the work. First, the toxicity of the air-dried, mature leaves, young leaves, seeds, fruits, and roots was determined. The dose of each of the powdered plant parts given to individual groups of rats was 1 g/kg administered for 6 consecutive days. Second, a study was made of the toxicity of the six extracts prepared by phytochemical methods from the young leaves. Expressed approximately, in terms of the dried young leaves, the doses of the extracts administered orally to the rats for 6 consecutive days were petroleum ether, 6 g/kg; ether, 8 g/kg; chloroform, 15 g/kg; absolute alcohol, 15 g/kg; 70-percent alcohol, 10 g/kg; cold distilled water, 10 g/kg. Third, the toxicity of an aqueous mixture of fresh green leaves was evaluated. The doses administered orally to groups of rats for 6 consecutive days were 0.75 g/kg; 1.5 g/kg; 2.0 g/kg; 3.0 g/kg. Fourth, a 45-day extended-toxicity study was performed using the dried, powdered, young *Gliricidia* leaves. The doses of the young leaves that were administered for 45 days were 0.25 g/kg; 0.50 g/kg; 1.00 g/kg. At the end of the 45-day test period, blood samples were taken for hematologic examination, and the animals were sacrificed. The intestinal tract of each animal was examined, and stained tissue mounts were prepared for histologic examination of the heart, liver, kidneys and spleen.

The fresh leaves, dried parts, and extracts of *Gliricidia sepium,* Jacq. used in this investigation appeared to be completely devoid of toxicity to rats. No deaths were observed in any of the groups of animals that could be attributed to the *Gliricidia* administered. The

animals' hair retained its normal luster; there were no signs of loss of reflexes, anorexia, chemosis, increase or decrease in salivation, gastrointestinal disturbances, or change in the consistency of the feces. The results of the hematologic and histologic examinations performed following the termination of the 45-day extended-toxicity study also indicated that there were no pathologic developments that could be used to differentiate the test animals from the control animals.

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A Device for Determining Time and Temperature of Sterilization in the Autoclave or Hot-Air Oven

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Since one often is concerned with whether or not sterilization has been properly carried out, a number of indicators have been marketed. Except for continuous-reading electric thermocouples, many of these indicators show only that the temperature has been reached.

Chemical melting points have always been acceptable as reliable indicators of temperature if they remain pure. By enclosing the proper compound in a sealed glass tube so constructed that it permits the flow of the molten material, one may determine the temperature as well as the length of time that the temperature remained constant. This apparatus is small and inexpensive and may be used countless times. It has a definite advantage in that it can be used in any place in the autoclave or oven and included in packages and containers of materials for sterilization.

An hourglass type of apparatus was constructed in such a manner that the solid chemical would melt and flow through a narrow constriction into the bottom tube (Fig. 1). Our idea was that, when molten, the material would flow through a standard-size opening at a uniform speed. Unfortunately, when the liquid formed in the upper part of the sealed hourglass-shaped tube, an air pocket formed and prevented the flow. When a side-arm by-pass tube was connected to the upper and lower sections, the air could pass freely and the molten material could flow. Thus by controlling the constriction in the tube and having the pressure equalized, we had a unit that was physically suited for our purpose.

There are many compounds that will melt at 121°C. Unfortunately, the problem is not quite as simple as merely selecting one of these compounds for our purpose, because some of them will not repeatedly melt and flow at the desired temperature.

In view of these considerations, we have used several compounds, two of which are succinic anhydride, $OCOCH_2CH_2CO$, mol. wt. 100.07, melting at 120°C; and *dl*-mandelic acid —$C_6H_5CHOHCOOH$, mol. wt. 152.14, melting at 120°C.

Mandelic acid is very applicable but unfortunately will melt and flow only once at 120°C. On repeated meltings, the melting temperature is considerably lower. This might be advantageous for a single use in certain operations. On the other hand, succinic anhydride remains constant in its ability to melt and flow repeatedly and is, therefore, our choice for use in this temperature range. Its physical characteristics are listed adequately (*1*).

To evaluate and observe these tubes we constructed an insulated oil bath with thermostatic controls and circulated with motor-driven propellers. Using this equipment, we were able to maintain a temperature of 120.5° to 121.5°C with ease and could determine the flow of various compounds at the desired temperature.

Tubes were constructed by professional glass manufacturers (*2*) with uniform dimensions, and the chemical compound of choice could be accurately weighed into the tube. They were heated in an oven to melt and the tube was sealed. Repeated tests showed that 1 g of

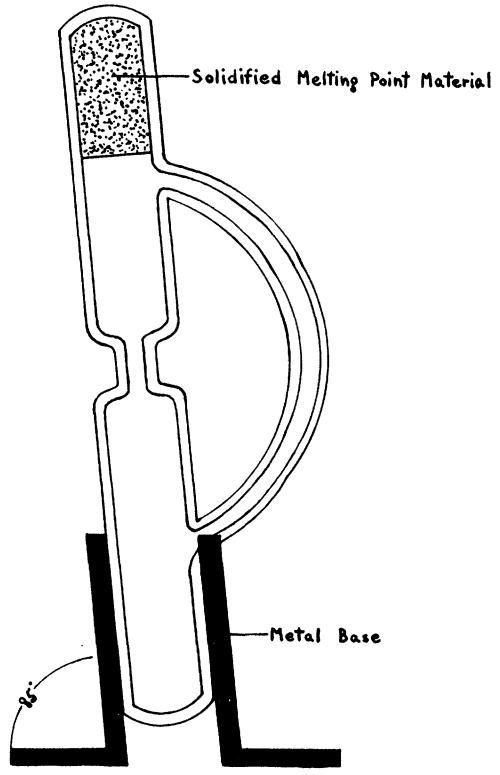

Fig. 1. Line drawing showing cross section of Time-at-Temperature device with metal base.