sample of 1 per cent. solution with an error not greater than 0.2 per cent. of the weight of the alcohol.

COLLEGE OF THE PACIFIC S. S. KISTLER

A SIMPLE BURNER FOR NATURAL GAS

WHEN natural gas arrived at New Orleans we found every Bunsen burner in the laboratory practically useless. They yielded a long, soft, non-roaring flame with no inner cone, which would not allow even simple bending of soft glass tubing. While there are probably excellent natural gas burners on the market, a very crude home-made device has proved so useful to us that it may be of interest to others who are encountering the same difficulties.

Fig. 1

A medicine dropper (A) with a fairly narrow aperture is attached to the gas supply and supported vertically in a burette clamp. A metal tube (B) about one half inch in diameter and seven or eight inches long (a section of common iron gas-pipe serves admirably) is similarly fixed just above the tip of the dropper. By proper alignment and up-and-down adjustment a very hot roaring flame with a good cone is obtained. The unimpeded air inflow is perhaps the explanation.

TULANE UNIVERSITY C. REYNOLDS

SPECIAL ARTICLES

GLUTATHIONE IN PLANTS[1]

FINK[2] in 1927 published a micro method for the determination of glutathione in insect tissues. Since that time the writer, at various times and with considerable success, has applied this method to his study of reproduction and sexual differentiation in plants. The study of glutathione seems important, for this dipeptide complex apparently has actual functions in the metabolism of the cell.

In making a determination the writer heated thin sections of fresh tissue in dilute acetic acid. They were then washed in a saturated solution of ammonium sulphate $(NH_4)_2SO_4$, and placed in a watch glass containing about 5 cc of the same solution. Five to fifteen drops of a 5 per cent. solution of sodium nitroprusside $Na_2Fe(CN)_5$ $(NO)2H_2O$ were added to the ammonium sulphate, and after a short while, time being allowed for thorough agitation and diffusion of the chemicals into the tissues, about 1 cc of ammonium hydroxide was added. On addition of the last, a color between pale pink and magenta flashed in the cells, and lasted from a few seconds to several minutes. The intensity and time of duration varied, presumably with the relative amount of glutathione.

The writer made observations of various species of plants. The following examples are sufficient to show the general results.

Longitudinal sections of the stem apex of young sunflowers (*Helianthus annuus*) were treated. The apical region of cell division flashed red, shading off into pink in the older region of cell elongation. Below this there was little or no color in the pith. However, two brilliant streaks extended downward from the apical region of cell division into and along the cambium, becoming a paler pink in the actively conducting phloem. In older plants, of the age when the stem apex had flattened out to form the disk, the reaction was much the same as that in the younger plants except that the brightly colored cells no longer formed a mass within the apex, but were distributed at the upper edge of the disk, the color being extremely intensified in the papillae which would later become individual flowers. In the next stage, during early development of the flowers, the tissues associated with the stamens showed pink, and the carpellate structures a fainter pink. Just before the opening of the flower bud, the staminate portions containing mature pollen showed practically no reaction, while the carpellate structures in their last stages of development showed pink ovularies and bright red ovules.

In the monosporangiate Arum (*Alocasia odora*) studies of the developing spadix showed a consistently more intense reaction in the staminate, or male, portion than in the carpellate, or female, portion of the axis.

Under controlled conditions corn (*Zea mays*) may be induced to produce plants with normal staminate tassels, with mixed tassels, with apical ears bearing functional carpels, or with a completely sterile apex.[3] Studies with the nitroprusside test indicated that the more intense reaction was in the tissues of plants having normal staminate tassels, and the least intense in the plants with a sterile apex, with an intermediate reaction in plants having a female, or carpellate, inflorescence at the apex.

The nitroprusside reaction, indicating glutathione, is thus helpful as an indicator of certain chemical reactions in cells, and may be used to advantage in measuring the metabolic level of various tissues during the ontogeny of the plant.

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[1] Paper from the department of botany, the Ohio State University, No. 236.

[2] Fink, SCIENCE, 65: 143, 1927.

[3] J. H. Schaffner, "Control of Sex Reversal in the Tassel of Indian Corn," *Bot. Gaz.*, 84: 440, 1927.