ot rutin, quercetin, and quercitrin were added to give concentrations ranging from 60 to 160 p.p.m. The flasks were heated for 5 minutes at 100° C. and incubated anaerobically for 10 days at 23° C. Sterile filtrates were then prepared and tested for toxin by inoculating 0.20-ml. amounts into mice.

Rutin in concentrations up to 1,000 p.p.m. did not prevent growth of *Cl. botulinum* or interfere with toxin production. Quercitrin was effective only in concentrations of about 1,000 p.p.m. The action of quercetin was, however, well marked, amounts of from 80 to 160 p.p.m. in the course of several trials preventing toxicity. In one experiment, using corn steep-casein medium alone, no toxin was demonstrated in a concentration of quercetin of 20 p.p.m. The action is antibacterial, only an occasional cell appearing in smears after incubation. Concentrations of quercetin as high as 1,000 p.p.m. failed, however, to inactivate preformed toxin of *Cl. botulinum* in 72 hours.

The limited action of quercitrin in preventing growth of *Cl. botulinum* in the present experiment may have been due to the presence in the sample of a small amount of quercetin. Also, it is considered possible that in certain samples of asparagus enough quercetin may naturally be present to check growth of *Cl. botulinum*. As lately shown by Naghski, Copley, and Couch (*4*), the compound is antagonistic to *Brucella abortus* and *Aerobacillus polymyxa* as well as to staphylococci. Whether anaerobic organisms in addition to *Cl. botulinum* are affected is at present uncertain.

References

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IN THE LABORATORY

A Flower Marker for Plant-breeding Operations

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Wherever controlled cross-pollinations are made on a large scale, any simplification of the method of marking flowers is desirable. String tags, which are often used for this purpose, are tedious to apply, especially to smaller flowers; require pencil or ink marking; and are susceptible to weather damage, which may even obliterate identification markings.

The requirements for this type of marker have been met economically by small pieces of "Twist-Ems"—a product devised for tying plants and for bunching root vegetables, consisting of a wire strand sealed by a waterproof adhesive between two narrow strips of heavy paper. These markers, used here for periods of three to five months, have proved to be quite weather resistant; moreover, they have been so durable that it has been possible to salvage them for satisfactory use in a second season.

When used to tag pollinated tomato flowers, "Twist-Ems" are cut into inch lengths. Each piece is folded at one end, placed on the flower so that the pedicel lies within the fold, and then folded in the same direction at the other end (Fig. 1). The second fold serves to lock the first one and thus prevents loss of the marker. Any identification markings can be protected from weathering by keeping them inside the folds. Although firmly attached, the marker will not prevent further growth; the wire of "Twist-Ems" is so easily bent that it does not constrict the developing pedicel.

Markers intended for various crosses can be distinguished by painting them different colors in fade-proof lacquers. Two or more colors can be applied in various combinations to the same marker in longitudinal or oblique stripes, thereby increasing greatly the number of different identifiable markers. Various combinations of letters or numbers (dates if desired) can be printed on the strips by means of an improvised rotary rubber stamp. The parents of a particular cross combinaiton can then be identified by reference to a key to the color or number combinations.

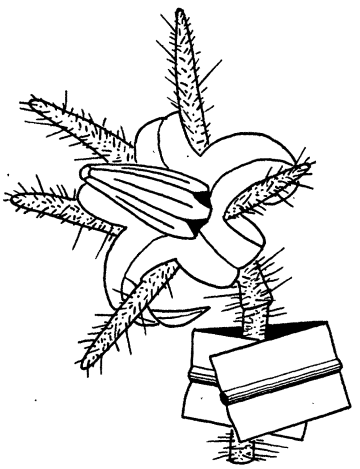

Fig. 1. Diagram of the flower marker placed on the pedicel of a tomato flower.

These markers have been used successfully for tagging flowers of tomatoes, asparagus, and cabbage as well as in marking stems and petioles of particular ages where later identification was needed. Many other uses in biological research might be found where large-scale marking is required.