TECHNICAL PAPERS

Culture of Fruits *in Vitro*

J. P. Nitsch

Kerckhoff Laboratories of Biology,
California Institute of Technology, Pasadena

While culture *in vitro* of plant tissues, isolated roots, stems, and seed embryos has become classical, no reports have yet been made of culture of fleshy fruits after separation of the flower from the plant.

In order to solve this problem, tomato flowers (*Lycopersicon esculentum* Mill.) of the San Jose variety have been cut off from the plant, sterilized with calcium hypochlorite, and planted in Erlenmeyer flasks containing various media. No growth occurred in a medium containing only mineral salts, sucrose, thiamine, and cysteine.

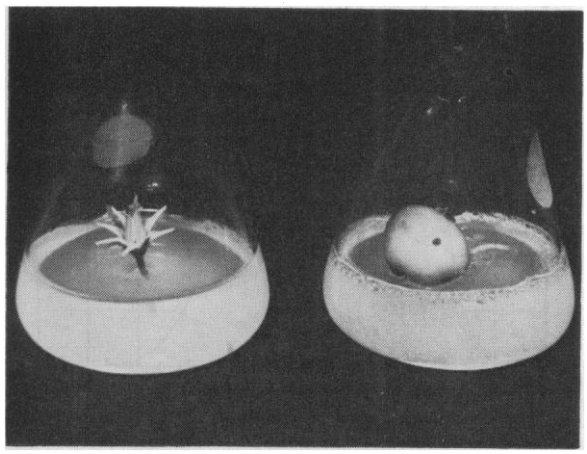

FIG. 1. *Left,* a tomato blossom planted in nutrient agar. *Right,* the tomato which developed one month later. Part of a root is visible on the right of the fruit.

The addition of sterile juice (autoclaved 15 min at 15 lb pressure) from either green or red tomatoes caused the ovaries to develop. A week after planting, the ovaries became visible, pushing up the petals and stamens which had kept them hidden (Fig. 1). The ovaries then enlarged regularly, as shown by diameter measurements, until about the 25th day after full bloom, when growth slowed down. About the 35th day, fruits turned red and ripened at the same time as the controls left on the plant. The growth curve of tomatoes growing *in vitro* (Fig. 2) is in accordance with that given by Judkins (*2*) for tomatoes attached to the plant.

Tomatoes raised from the flower in flasks tasted like usual tomatoes. They were seedless, which might be due either to lack of pollination (the plants were raised in a greenhouse where pollination was very poor) or to killing of the pollen tubes by the sterilizing chemicals. The size

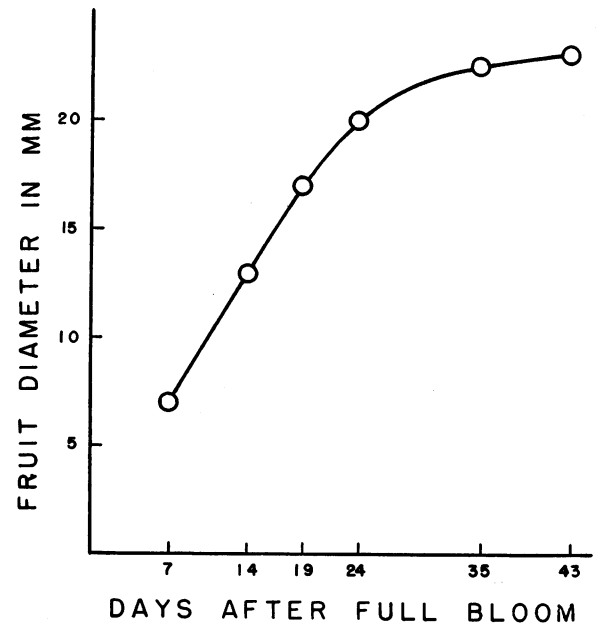

FIG. 2. Growth curve of a tomato grown *in vitro*.

of the fruits was small (about 1 in. in diam), but each flower had only 40 ml of nutrient at its disposal. In some instances, roots developed on the flower stalk; such a fact has been reported only rarely in the literature (*1*).

The factors causing the action of tomato juice on root development and ovary growth were determined by the use of entirely synthetic media. Flowers planted in a medium containing mineral salts, sucrose (4%), vitamin A (1.5 mg/l), thiamine (1 mg/l), riboflavin (1 mg/l), niacin (10 mg/l), and L-tryptophane (10 mg/l) developed roots in the dark but no fruits. The same results were obtained when tryptophane was replaced by α-naphthaleneacetic acid (25 μg/l). Root development was inhibited in the light. On the contrary, using a medium containing mineral salts, sucrose (5%), thiamine (1 mg/l), cysteine (10 mg/l), and β-naphthoxyacetic acid (1 mg/l), small tomatoes were obtained which ripened in the light without the initiation of any roots.

These preliminary results show that it is possible to raise *in vitro* fruits from flowers which have been separated from the plant. Experiments are in progress to obtain full-sized fruits and to cultivate other species by this technique.

References

1. BOUILLENNE, R. and WENT, F. *Anal. du Jardin Bot. de Buitenzorg,* 1933, **43**, 144.
2. JUDKINS, W. P. *Proc. Amer. Soc. hort. Sci.,* 1939, **37**, 891.