cross-pollination.

This mutation is the first instance of simply inherited male sterility to be reported for cucumber. Because it is simply inherited it should prove useful in the production of F1 hybrids. Since the inheritance pattern appeared different from that of the male sterile cucumber reported by Barnes (1), the gene is designated ms2. The absence of linkage between the male sterility factor and the radiation-induced translocation in the second male sterile was disappointing, as linkage would have permitted partial pollen sterility to be used as a marker for heterozygotes. However, the development and identification of this translocation stock makes possible a new approach to linkage studies in cucumber.

Literature Cited

Influence of Detachment from the Tree on the Respiration of Apples1,2

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Abstract. Fruit detachment and small branch removal before fruit harvest stimulated the rise in the climacteric. Defoliation and removal of the phloem from the fruit pedicels stimulated the rise in only about one-half of the experiments. IAA sprays gave erratic results, with an increase in the time of the respiratory rise in about half of the cases. Sprays of GA had no effect. Fruit dipping after harvest in IAA, GA, ABA, and trachael sap had no effect on subsequent respiration.

There probably is no written record of the time when man discovered that many fruits ripened faster off the tree than on the tree. Biale (1) pointed out that detachment is a very profound factor affecting ripening of the avocado. Later studies (2) with this fruit suggested that the inhibitory effect of attachment on ripening was due to some substance made in the leaves. They further concluded that this substance was translocated through the phloem. Other workers (7) have also suggested that the inhibitor was supplied by the leaves. Several investigators (9, 13, and 14) have suggested that the stimulating factor might be something like indoleacetic acid (IAA) and the restraining factor might be gibberellic acid (GA). Mapson (10) said that the inhibitory factor might be identical with auxin but it is possible that high and low concn of auxin could have different effects.

Gerhardt (8) indicated that detached apples and pears softened faster than attached fruits. Magness (11) pointed out that 'Bartlett' pears could be "stored" on the tree for about 2 weeks. Wilkinson (15) found that detached apples went through the climacteric rise when tied back on the tree after picking, whereas with normally attached fruits the rise was considerably delayed. He concluded that the inhibitor traveled through the xylem to the fruit.

The present studies were conducted with 8 cultivars over a period of 3 years to try to elucidate some of the attachment-detachment effects on apple respiration.

Materials and Methods
Duplicate 1 kilo lots of apples were held in respirometers for 24 hr before the first respiration measurements were made at 70°F. A Beckman IR 215 infra-red CO2 analyzer was used to measure the CO2 evolved, using a flow rate of 200 ml/min.

In some experiments the fruit was dipped in the test chemicals before respiration measurements were made. When this was done they were left in a moist chamber for 2 hr after dipping to try to get some absorption. One of the test materials was "trachael sap." This was extracted from apple tree water sprouts after the method of Bollard (3). The juice was frozen at 0°F for 1-7 days before use. The concn ranged between 100-12,000 ppm on 'Dutchess', 'Peerless', and 'Milton'.

ABA, IAA, and GA were used as momentary dip treatments on harvested apples. ABA was used at concn between 25 and 250 ppm on 'Healthy', 'McIntosh', and 'Delicious'. GA (9) was used in the range of 100 to 1,000 ppm on 'Milton'. IAA was used on 'Milton' with a concn range of 50 to 800 ppm. With both the dip and spray treatments, Tween 20 at .1 to .2% was used as a wetting agent.

In 1969 the fruits detached for later respiration measurements were held in the lab at 70°F. In 1970 and 1971 they were held in a wire mesh basket tied to a branch in the shaded part of the test trees until the remainder of the apples were harvested. The "branch cut" treatment refers to cutting 2-3 inch diam branches with fruits attached. In 1969 they were held in the lab at 70°F. In 1970 they were held in the shade of the test trees. The butts of these branches were placed in water.

In some experiments the fruit stems were scraped down to the woody xylem while the fruits were still attached to the tree.

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2Grateful acknowledgment is given for the donations of chemicals by Amchem Co., R. Hoffman-LaRoche Co., and Merck Co.
This treatment presumably removed the phloem.

Results and Discussion

Dipping fruit. Assuming that a ripening inhibitor might be present in the trachael sap of water sprouts, this material was used as a dip treatment on 3 cultivars. There was no respiration response so the data are not presented.

Limb sprays. Since it is well known that ethylene plays a role in fruit ripening and since ethephon [(2-chloroethyl)phosphonic acid] had an ethylene effect on apples (6), this material was studied. When the fruits of 'Wealthy' alone were treated there was no respiratory increase. When either the leaves or the leaves plus fruit were sprayed there was a premature climacteric rise (see Fig. 1). This experiment was repeated with 'McIntosh' and similar results were obtained. These experiments suggest that the ethylene effect of ethephon is more likely through the leaves than through the fruit directly. On the other hand, the fruit was given only a momentary dip which might not have been sufficient to result in absorption. Whether the ripening inhibitor is related to or is overcome by release of ethylene from ethephon is not known.

Several chemicals were tried to see if they might act as either respiratory stimulants or depressants. Sprays of IAA were made on several cultivars over a period of 2 years. Figure 2 shows a slight stimulation of respiration, yet in 12 experiments with concn ranging from 100 to 500 ppm of this compound, only 7 showed respiratory increases. The response or lack of it could not be associated with cultivar (8 tested) or interval between time of spraying and harvest. These data are not presented.

Figure 2 also shows a slight stimulation of respiration with ABA at 100 ppm with 'Delicious'. This possible stimulation was found in only 3 of 11 experiments which included 6 cultivars. The concn ranged between 100 and 200 ppm.

Sprays of GA at 250 to 500 ppm on 7 cultivars in 10 experiments showed no effect on respiration. The data are not presented.

Effects of fruit detachment, branch removal, defoliation, and phloem removal. In 6 experiments including 4 cultivars, fruit detachment always markedly stimulated the climacteric rise. In some cases as illustrated in Fig. 3 and 4 the detached fruits were postclimacteric at the start of the respiration trials whereas the control fruits were still preclimacteric.

In 4 experiments involving 3 cultivars, cutting branches with the fruit still attached always advanced the climacteric rise. This
Culture of Apple Shoots from Buds in Vitro\textsuperscript{1,2}

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Abstract. Axillary buds from apple shoots when cultured aseptically in vitro readily develop into new shoots. A nutrient medium is used consisting of sucrose and macro and micro elements. Buds grown in stationary culture develop into shoots with small leaves and short internodes. The miniature condition appears to be due to inability of the rootless explants to absorb sufficient nutrients. When buds are cultured in rotating culture where the developing leaves are bathed in nutrient solution, shoots of near normal size and appearance are produced. Light is essential for growth. Low concn of abscisic acid prevents growth of the buds.

In recent years tissue and organ culture have become commonplace. The techniques have enabled investigators to study the requirements for growth and development of material isolated from the effects of the intact organisms, and to manipulate the material in ways otherwise not possible. Excised buds, cultured aseptically in vitro, could be useful for various types of investigations. We originally hoped to employ this technique as a bioassay for growth regulating substances in bud dormancy; there are other possible applications. We present here our findings on culture techniques.

Materials and Methods

Initial work utilized bud material from mature trees of 'Cortland' growing in the Cornell orchard. This material was difficult to sterilize, but that could be accomplished if most of the bud scales were removed. All work described here, unless otherwise noted, utilized bud material from greenhouse grown 'Northern Spy' seedlings. This material could be sterilized

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\textsuperscript{1}Received for publication March 16, 1971.

\textsuperscript{2}Some of the results reported here are taken from the M.S. Thesis of Roger D. Dutcher, 1967. The aseptic culture of buds of the apple (Pyrus malus L.). M.S. Thesis, Cornell University. 80 p.