detectable. Results from the first plantings sampled are given in Table 1.

The entire assembly (Fig. 1) slides freely in the vertical direction by means of a guide (A) that fits a standard ring stand (B). The assembly can be locked in place by a set screw (C). With the point of the drop-rod even with the base of the guide tube (D), the top of the rod (E) is zeroed on the measuring scale (F). After zeroing, the rod is pulled up until the trigger (G) engages the circular groove (H) in the rod. The entire assembly is raised, and the fruit, held in a concave base (I), is moved into position. The assembly is lowered so that the base of the guide tube (J) rests on the cut fruit. In positioning the tube base, segment membranes, central core, and peel are avoided. The rod is dropped by releasing the trigger, and the amount of penetration is read directly on the scale.

The guide tube (D) can be raised or lowered to increase or decrease the amount of drop. It is held in place by set screw (K). The measuring scale (F) is adjustable, so that the top of the drop rod can be zeroed for any drop that is used. Set screw (L) holds the scale in place.

The dimensions of the present instrument were determined by the materials available and a combination of rod length and diameter that gave a usable range of penetration with the fruits being tested. The 10-inch guide tube is one-quarter inch copper tubing. The 12-inch drop rod is a 3 16-inch brass rod. The point was formed by tapering the last five-eighths inch of the rod down to a 1 16-inch diameter tip. Points of different diameters and taper might be needed for testing fruits with different characteristics. Other parts were machined from standard brass rod stock.

The instrument has only been used for testing flesh firmness in seedless oranges. It would not be applicable to fruits with more than a few seeds, because of interference with the penetration of the rod. Using 10 fruits per tree, it has been possible to identify trees of two selections of Navel orange that differ in pulp softness.

Abortion of Flower Buds in Chrysanthemum After Application of a Selected Petroleum Fraction of High Aromatic Content

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Abstract: Alkylnaphthalenes are used as solvents for chlorinated insecticides and herbicides. Johnson, Yeomans, and Smith (2) reported that these solvents could cause the death of the apical meristems of chrysanthemums when applied in concentrated solutions or in mechanically or thermally generated aerosols. Controlling the number of flowers and fruits on a stem is not only of academic interest but of practical importance. They are now controlled on chrysanthemums by removing the excess by hand. Research reported in this paper show that HAN,[R] a petroleum fraction containing a large percentage of alkylnaphthalenes, can be used to control the number of flowers borne by chrysanthemum plants.

The effect of HAN was detected in a survey of the various types of solvents used in the formulation of insecticides, reported in part in (2). Chrysanthemum plants were placed in large drums and exposed to oil aerosols atomized with air pressure of 10 psig. The aerosol treatments required exposure of the plants to the oil droplets for 1 to 2 hours in a closed drum. The paraffin-base oils, relatively non-toxic, were ineffective in causing the abortion of the flower buds. The petroleum fractions containing appreciable amounts of alkylated naphthalenes caused some distortion of the leaves (2), and (depending on the stage of development of plant) death of the apical meristem and abortion of the lateral flower buds. The heavy aromatic naphthas were particularly active in the tests.

Spray applications were also tested. Cuttings of *C. morifolium* cv. Fred Shoesmith (9), were propagated on July 15, 1965 and potted on August 5, 1965. The plants were grown in 4-inch pots on natural days with an interruption of 10 ft-c incandescent-filament lamps from 10 pm to 2 am nightly. The greenhouse was maintained at a minimum night temperature of 17°C. The plants were transferred to 8-hour days on September 1, 1965. On September 10, 13, 14, 15, 16, and

Figure 1. Plants of *C. morifolium* cv. Fred Shoesmith, propagated July 15, 1965, potted August 5; growing point removed August 19, and 8-hour days at 17°C from September 1. Plant on left sprayed with 1% HAN, 0.1% Triton X-100 on September 15. Plant in center sprayed with 0.1% Triton X-100 on September 15. Plant on right had the lateral flower buds removed by hand on October 6 (two flower buds developed subsequently). Photographed November 17, 1965.

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17 (9, 12, 13, 14, 15, and 16 short days, respectively), lots of plants were sprayed to run-off with 0.5, 1, and 2% HAN. The mixture of compounds was not soluble in water; an emulsion was prepared by dissolving in the HAN sufficient Triton X-100 (isooctyl phenyl polyethosyethanol) to give 0.1% of the emulsifier in the final spray and then dispersing this concentrate in water.

Treatment with HAN on the 9th and 12th short day caused the death of the apical meristem; the lateral flower buds 7 or 8 nodes down the stem developed flowers. Treatment on the 13th, 14th, and 15th short day caused the abortion of the lateral flower buds. The terminal flower bud was unaffected, and flowered at the same time as terminal flower buds grown with the lateral flower buds removed by hand (Fig. 1).

A 1.0% emulsion of HAN was the most effective dosage. Treatment with 0.5% emulsion caused the abortion of only a part of the lateral flower buds. Treatment with a 2.0% emulsion reduced the number of florets which developed on the flower head. Treatment on the 16th short day, or later, caused the abortion of only a few of the lateral flower buds. HAN was most effective as a 1% foliar spray during the fall; a 2% foliar spray was the optimum one during the summer. The optimum treatment time, as measured by the number of short days, was the 14th or 15th short day. Treatments on sunny days were less effective than those made on cloudy days. Plants placed in chambers held at high humidity, and treated with HAN, developed damaged foilage, but the flower buds were unaffected.

The response of the various chrysanthemum cultivars to treatment with HAN varied greatly. Fred Shoesmith was responsive to 1% emulsion of HAN in the September test (reported here); abortion of all lateral flower buds occurred. Yellow Delaware and Princess Anne responded to 3% and 5% emulsions of HAN, respectively. The treatment caused the abortion of only a portion of the lateral flower buds. Shasta and Improved Indianapolis Yellow developed yellow leaves with black margins in response to treatment with 5% emulsions of HAN. The lateral flower buds were unaffected at all dosages tested.

Dilute auxin sprays are used to reduce the number of flowers which develop on fruit trees (3). Maleic hydrazide has been used to control the growth of lateral buds of tobacco (8) and chrysanthemum (1). Marth and Mitchell (4) reported that Chloro-IPC gave a sucker-retarding effect similar to maleic hydrazide. Tso (6), and Tso, Steffens, and Engelhaupt (7) reported that the methyl esters of fatty acids caused the death of lateral shoots on tobacco. The optimum carbon chain-length was C_{10}, methyl caprate. These chemicals were ineffective in causing the abortion of flower buds on chrysanthemum.

HAN is a selected petroleum fraction of high aromatic content (approximately 87% by weight). About half the aromatics present are alkylnapthalenes, predominantly C_{10} to C_{13} (5). It may act similarly to the methyl esters of the fatty acids by killing all tissues with high rates of cell division (6, 7). The differences in response may be due to the species tested, and to the presence of aromatic compounds which are reported to affect growth.

Various fractions of HAN are now under test to determine which parts of the complex mixture of naphthalenes, indenes, tetralin, indanes, and alkylbenzenes are responsible for the abortion of the flower buds of chrysanthemum, and also to determine their relation to known metabolic inhibitors.

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9. HAN was supplied by the Humble Oil and Refining Company, Houston, Texas. Chrysanthemum cuttings were supplied by Yoder Brothers, Barberton, Ohio. Mention of a trade name is for identification and does not imply endorsement by the U. S. Department of Agriculture.

Pollen Nuclear Division Prevented with Toluidine Blue in *Vinca Rosea* L.

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Abstract. A study was made on the effect of toluidine blue on the division of the generative nucleus in pollen tubes of *Vinca rosea* L. grown *in vitro*. Division was prevented in a percentage of pollen tubes, dependent on the concentration of the dye and duration of the treatment.

Haploid sporophytes of higher plants are useful for genetic and cytological research but are of relatively rare natural occurrence (3). A method for producing haploids quickly, with regularity, would be of great value in breeding programs and cytogenetic studies. Production of haploid frog embryos has been reported by Briggs (1) using the basic dye, toluidine blue, as a sperm inactivator. This dye inactivated the frog sperm nucleus without affecting the extra-nuclear parts of the cell. Consequently, at fertilization the sperm nucleus remained condensed and did not fuse with the egg nucleus.

The same type of reaction might occur if this dye were used on pollen. Although the dye might inactivate the generative nucleus, the pollen tube might still discharge its contents into the embryo sac. It is theorized that the egg could then be stimulated to develop into a haploid plant since the male chromosomes would be prevented from fusion with the female chromosomes. Therefore, this study was undertaken to determine the effect of toluidine blue on the division of the generative nucleus in *Vinca rosea* L.

Pollen of *Vinca rosea* L. was treated by immersion in concentrations of from 5-500 ppm of toluidine blue for from 1 to 30 minutes. It was then removed, cultured on an agar-sugar and yeast medium (2), stained and examined for generative or sperm nuclei. Control slides were prepared for each set of slides of treated pollen and examined for nuclei before observation of the treated slides (Fig. 1). When all nuclei had divided on control slides, the slides