magnification can, of course, be used. The centrifugal force attainable by means of the Beams' rotor is limited only by strength of materials, and for microscopic observations by this method, is determined by the strength of the glass container of the living cells. This might be put at 200,000 times gravity. Such an arrangement should be particularly useful for determining molecular weights of substances by the method of sedimentation, for observing movement of materials in highly viscous cells and for observing the change in shape of living cells due to the stretching forces of light and heavier material. From such observations one is frequently able to gain an idea of the surface and other forces which counteract distortion.[4] In order that a cell may not be completely crushed by forces thousands of times gravity, it is necessary to adopt the expedient of suspending the material in a medium of graded density, so that the cell comes to lie in a stratum of equal density, and is thereby perfectly cushioned against crushing. Magnified observation of centrifuged material during centrifuging is so easily carried out that the microscope-centrifuge should be a most useful tool in every laboratory.

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A SIMPLE METHOD FOR SEPARATING CERTAIN INSECTS FROM FOOD PRODUCTS

IN connection with the enforcement of the Federal food and drugs act, the writer had occasion, during the raspberry canning season of 1929, to assist in making a survey of the extent of infestation of raspberry fruit by the larvae of *Byturus unicolor* Say. A simple rapid method for the detection of larvae is very desirable for this purpose as well as for determining the fitness of the fruit for food purposes prior to canning. A description of the method as devised is given at this time in the thought that it may be of general use in entomological studies.

Methods of decantation with water were found to be inadequate because the large number of seeds in the raspberries interfered with the rapid detection of the larvae. After considerable experimentation it was found that the incorporation of some oily substance, such as kerosene or gasoline, with the cooked and pulped raspberries caused the larvae to rise to the surface of the subsequently diluted liquid. It was originally thought that the larvae must first be saturated with the oil, and for that reason a method of shaking the oil with a partially diluted pulp in a large Mason jar was devised. While this method gave good results, it was soon found that prolonged shaking was unnecessary, it being essential merely to bring the larvae into contact with the oil-water interface.

The method as recommended for factory testing of raspberries is given below. For other purposes changes will no doubt be advisable. The esssential points in detecting the larvae by the use of gasoline or kerosene are: (1) Maceration of the fruit, (2) formation of oil globules throughout the liquid, and (3) careful agitation at end of test to permit all the larvae to come to the top.

The materials required are: (1) Gasoline or kerosene, (2) two No. 10 cans (approximately 3,100 cc each), (3) one No. 2 can (approximately 580 cc), (4) a large spoon or paddle, (5) source of heat, (6) small graduate, (7) forceps and (8) a shallow pan.

PROCEDURE

(1) Fill the No. 2 can with the raspberries to be tested.

(2) Pour berries into a No. 10 can, crush with spoon and cook until soft. If steam heat is used see to it that it is as dry as possible so as not to allow the can to become more than one fourth full of pulp and steam condensate. With dry heat, add enough water to facilitate cooking.

(3) Add 1 to 2 ounces of gasoline or kerosene to the can and stir vigorously.

(Caution: The need of guarding against fire and explosion should not be overlooked.)

(4) Fill the can nearly full with water.

(5) Allow water and pulp to come to rest and examine the surface for larvae. All insects should be picked off with the forceps as soon as located.

(6) Since some of the larvae may be entangled in the pulp, it should be stirred several times, and the surface examined after each stirring. In stirring, the water should be given a rotary movement, then, by placing the spoon in a slanting position along the side of the can, an upward current can be established which helps to bring the larvae to the surface.

Some prefer to pour the contents of the No. 10 can directly into a shallow pan, rinsing out the No. 10 can into the pan and adding enough water to fill the pan to the depth of about 2 inches with liquid and pulp.

(7) As a final precaution, pour the mixture from one No. 10 can to the other, or from pan to can, once or twice, and examine the surface each time for insects.

Insects commonly found in infested foods, in general, respond to the gasoline treatment. This method, or some modification of it, has been found useful in the examination of cereal products, fig paste, spinach and turnip greens, as well as raspberries. Unfortunately the maggot of the cherry fly and of the blueberry fly, and possibly other maggots, do not rise to the surface on such treatment.

[4] E. N. Harvey, *Biol. Bull.*, 60: 67, 1931; 61: 273, 1931.

Trials of the method have been made during the 1929, 1930 and 1931 seasons by the simple expedient of adding a known number of live larvae to the sample before testing. In only two instances out of 76 trials was there a failure to recover the full number of larvae added.

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SPECIAL ARTICLES

PATERNAL AND MATERNAL INHERITANCE IN FRAGARIA

IRREGULARITIES in the behavior of Fragaria in breeding have been recorded by several investigators. Many cases are recorded where the F_1 seedlings have the characteristics of the female parent only, while a few cases are mentioned by Millardet[1], Solms-Laubach[2], Longley[3] and Ichijima[4], where the F_1 seedlings have the characteristics of the male parent only. In all the cases where pure maternal or paternal inheritance has been observed by the various writers, the seedlings have been crosses between parents having different chromosome numbers. That this type of inheritance also occurs in cases where two plants with the same number of chromosomes are crossed is shown by results obtained at the Oregon State Experiment Station at Corvallis, Oregon.

Several different selections of the wild field strawberry, commonly known as *Fragaria cuneifolia,* were crossed with horticultural varieties by C. E. Schuster in 1929. These were set in the field in March, 1930, and the results were observed in May and June, 1931. One set of crosses consisted of the horticultural variety Gold Dollar[5] (derived from *F. virginiana* x *F. chiloensis*) x *F. cuneifolia,* both of which have 28 chromosomes. In a set of 2,015 seedlings there were 37 plants which showed paternal inheritance only. In a set of 420 plants of Ettersburg 121 x *F. cuneifolia* there was one plant that showed apparently pure paternal inheritance and three that were doubtful. A set of 948 plants of the cross U. S. D. A. No. 147A x *F. cuneifolia* contained two plants with apparently pure paternal inheritance and seven dwarfs. In all there were 43 plants with paternal inheritance only out of 3,519, or 1.2 per cent.

In addition to the above crosses, using *F. cuneifolia* as the male parent, there were two sets of crosses in which pistillate selections of this species were used as the female parents. In a set of 207 plants of the cross *F. cuneifolia* x Gold Dollar, there was one plant with apparently pure maternal inheritance. The flowers were pistillate but sterile. Another selection of *F. cuneifolia,* also crossed with Gold Dollar, contained one plant which appeared to be pure paternal in inheritance in a set of 216 plants. There was also a set of 216 plants of the cross Corvallis x *F. cuneifolia* which had no cases of pure maternal or paternal inheritance that could be detected.

The plants which showed the inheritance from the species (*F. cuneifolia*) parent only were much smaller than the true hybrids, and had all the plant characters of the wild species. A single typical plant of each of the two types in the set of Marshall x *F. cuneifolia* crosses was measured with the following results:

	Plant with pure paternal inheritance	True cross
Fresh weight in grams	130	700
Number of leaves	67	105
Average size of leaves, sq. cm.	16.6	106
Total leaf area, sq. cm.	1,109	11,130

These figures are from only one plant of each kind, but they were representative of the lots and the figures are sufficiently striking to show the difference between the types.

The true hybrids were large vigorous plants, showing the effect of hybrid vigor. Almost without exception they were larger than most of the crosses between cultivated varieties. One plant of the cross Ettersburg 121 x *F. cuneifolia* had as many as 1,352 flowers on it. They showed considerable variation, but were intermediate in most characters between the types of the two parents. The plants with the pure paternal or maternal inheritance of the species were almost or entirely sterile, but the berries produced were distinctly of the type of the species.

No chromosome counts have been made on these plants, and it is not known whether the haploid or diploid number prevails in the somatic tissue of the plants showing inheritance from only one parent. If only one nucleus went into the make-up of the plants the number could have been reduced to haploid through the lack of conjugation, or the diploid number may have been restored by doubling in microsporocyte, as suggested by Ichijima.

It is easily possible that this type of inheritance

[1] A. Millardet, "Note sur hybridation sans croisement ou fausse hybridation." *Mem. Sci. Phys. et Nat. Bordeaux,* 1894, 4 ser., IV: 347–372.

[2] H. Solms-Laubach, "Uber unsere Erdbeeren und ihre Geschichte." *Bot. Ztg.* 65, 1 Abt. 45–76, 1907.

[3] A. E. Longley, "Chromosomes and Their Significance in Strawberry Classification," *Jour. Agr. Res.,* 32: 559–568, 1926.

[4] K. Ichijima, "Studies on the Genetics of Fragaria," *Zeitschrift für Induktiv Abstammungs und Vererbungslehre,* Bd. L V, Heft 4: 300–347, 1930.

[5] In all references to strawberry crosses the female parent is mentioned first.