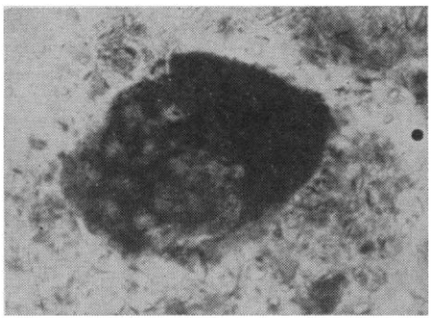

Fig. 1. Giant cell of a giant cell tumor of bone. The succinic dehydrogenase activity is localized especially in the cytoplasm (technique of Rosa and Velardo). (About × 347)

that osteoclasts and chondroclasts contain several enzymes the distribution of which follows a typical pattern. The distribution of alkaline phosphatase, acid phosphatase, esterases, aminopolipeptidase, beta-glucuronidase, and other enyzmes in bone tissues has been described by several authors (*1–4*). Tonna (*5*) has shown the distribution of succinic dehydrogenase in periosteum without describing in detail the cellular elements involved in the reaction.

We have studied the histochemical distribution of succinic dehydrogenase, using the technique of Rosa and Velardo (*6*). In this technique neotetrazolium chloride is used to show enzymatic activity in the presence of potassium cyanide. The study was made on endochondral and membranous growing areas of bone of 5-day-old C3H/Ba rats, 5-day-old Wistar rats, and newborn human beings. Frozen sections (30 to 50 μ thick) without previous decalcification were used.

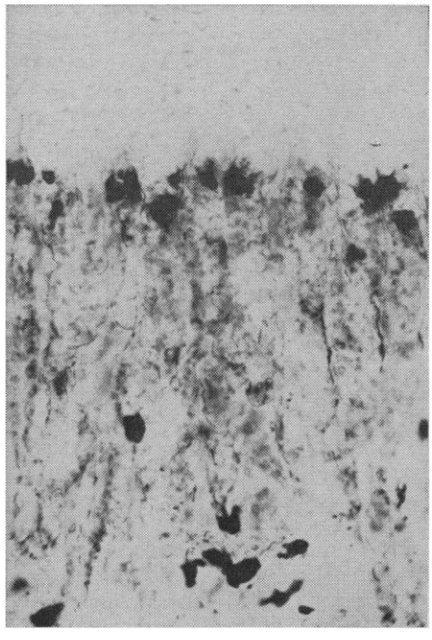

Fig. 2. Enchondral ossification of the growing zone of a human rib. The enzymatic activity is localized in the osteoclasts and chondroclasts (technique of Rosa and Velardo). (About × 104)

After incubation for a short period (5 to 15 minutes) an intense enzymatic reaction in the giant cells (osteoclasts and chondroclasts) involved in bone and cartilage resorption was apparent; the reaction was localized especially in the cytoplasm. After longer periods of incubation diformazan granules with a cytoplasmatic distribution appeared in almost all cartilaginous cells and in osteoblasts. The latter reaction was much weaker than that which took place in osteoclasts and chondroclasts. Still weaker was the reaction present in hypertrophic calcified cartilaginous cells. In three cases of giant cell tumors of bone, great enzymatic activity was observed in the giant cells characteristic of this tumor (see Figs. 1 and 2).

These results, together with the finding that other enzymes such as acid phosphatase (*2*), beta-glucuronidase (*4*), and aminopolipeptidase (*3*) were present in osteoclasts and chondroclasts, seem to confirm the hypothesis that these cells are not passive elements but cells with a high metabolic activity.

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10 November 1959

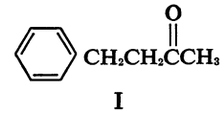
New Synthetic Lures for the Male Melon Fly

Abstract. Several *para*-substituted derivatives of 4-phenyl-2-butanone (I) have proved to be powerful attractants for the male melon fly (*Dacus cucurbitae*). These compounds, unlike anisylacetone, heretofore the best lure, attract even newly emerged flies. The most potent analog is 4-(*p*-acetoxyphenyl)-2-butanone (II), which also strongly attracts *Dacus ochrosiae* males.

Many insects depend on odors to guide them to a vital need—food, mate, host plant or animal, or oviposition site. Some odors evoke so compelling a response that the insect appears to have little choice but to seek out the source. The odors of some synthetics exhibit this action and are specific in that they attract only one or a few closely related species. Such lures have proved invaluable when used in traps for detecting infestations of harmful insects. Control or eradication measures can then most efficiently be applied only where, and as long as, insects are caught.

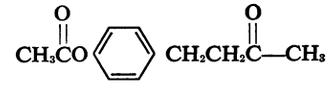
The use of anisylacetone as a lure for the male melon fly (*Dacus cucurbitae* Coq.) was reported in *Science* several years ago (*1*). However, its potency is not great, and it does not attract flies until after they attain sexual maturity—that is, 7 or more days (usually 10 or 11 days under field conditions in Hawaii) after emergence from pupation. A lure that attracts sexually immature males has an important advantage in that it enables the early detection of infestations so that control or eradication measures may be instituted before the insects have a chance to mate (*2*).

Our search for better lures has centered mainly around compounds related to anisylacetone, more specifically around derivatives of 4-phenyl-2-butanone (I).



I

These efforts were rewarded by the finding of a number of compounds that are not only more powerful and persistent but, more important, are also attractive to newly emerged male melon flies. The best of these materials is 4-(*p*-acetoxyphenyl)-2-butanone (II).



II

It was made by condensing acetone with *p*-hydroxybenzaldehyde in an alkaline medium by a procedure similar to that described by Drake and Allen (*3*), hydrogenating the product at 1800 lb/in.^{2} and 70°C with nickel kieselguhr catalyst, or by condensing phenol with 4-hydroxy-2-butanone according to Maki *et al.* (*4*), and acetylating; bp 123° to 124°C/0.2mm; n_D^{25} 1.5059. Theory for $C_{12}H_{14}O_3$: C, 69.99; H, 6.84. Found C, 69.38; H, 7.13.

Surprisingly, the ortho and meta isomers of II were practically ineffective.

In field tests candidate lures were each exposed in 10 Steiner plastic traps (*5*) which contained a lindane-chlordane mixture to assist in killing flies. One application of 2 gm of lure was made in each trap except for the

anisylacetone trap, in which 5 gm was applied. The best compounds and the total number of male melon flies caught in 61 days are given below:

4(*p*-Acetoxyphenyl)-2-butanone	30,752
4(*p*-Propionoxyphenyl)-2-butanone	22,985
4(*p*-Hydroxyphenyl)-2-butanone (*6*)	14,574
4(*p*-Butyroxyphenyl)-2-butanone	12,508
4(*p*-Isovaleroxyphenyl)-2-butanone	6,894
Anisylacetone	2,408

When used recently for survey purposes in the Mariana Islands, 4(*p*-acetoxyphenyl)-2-butanone proved to be very attractive to *Dacus ochrosiae* (Malloch) males.

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14 December 1959

Permeability Measurements of Castor-Bean Seed Indicative of Cold-Test Performance

Abstract. The conductivity and reducing-sugar content of water extracts of seeds were found to be correlated with stands produced under conditions favoring pre-emergence damping-off. Conductivity proved to be a rapid method of predicting relative differences in cold-test stands from lots of seed of the same variety.

Field stands of castor beans produced by different seed lots often reflect differences in quality not apparent from the percentage germination of the seed in a germinator, or from test weight, weight per number of seed, or appearance. I have used a cold test similar to the ones used for corn (*1*) to distinguish such differences, but such a test has the disadvantages of being time-consuming and difficult to standardize.

Reduced germination in a cold test has been shown to be due to various soil fungi, mainly *Pythium* spp., causing seed rot. Hottes and Huelson (*2*) and Tatum (*3*) suggested that materials leached from the seed serve as food that promotes the growth of fungi. They demonstrated a relation between seed permeability and germination or cold-test reaction by measuring the turbidity of seed steep water. Presley (*4*) reported that conductivity of distilled water leachings from cotton seeds at various stages of deterioration was a more rapid and accurate measure of seed viability than turbidity. Preliminary studies in this laboratory with castor bean indicated that water leachings from seed susceptible to rot contained sufficient sugar to promote fungus growth. The value and limitations of conductivity and reducing-sugar determinations of water extracts of castor-bean seed as a measure of susceptibility to seed-rotting fungi are described below.

Table 1. Relation of electrical resistance of seed steep water to cold-test reaction.

Variety	No. of lots	Resistance range (ohm/cm)	Stand range (%)	Correlation coefficient
		Experimental lots		
Baker 296	8	2400–1500	84–50	.93*
Cimarron	8	8700–1100	39– 8	.95*
Dawn	6	5300–1300	78– 5	.97*
Custer	5	3200–2000	72–44	.88†
		Commercial lots		
Baker 296	24	3100–1285	49– 7	.92*
Baker 296	29	3142–1337	32– 5	.94*‡

* Significant at .01. † Significant at .05. ‡ Partial correlation with weight per 100 seed; the linear correlation coefficient (weight per 100 seed not considered) was .86 (significant at .01).

In the first of these studies, seeds from the first, second, and third sequential sets of racemes were harvested at Beltsville, Md., from field plots of the varieties Cimarron, Dawn, Baker 296, Custer, and Cimarron hybrid. Clean, undamaged seeds from each raceme and variety and plot were subjected to permeability and cold tests. Three lots of 100 seed each were steeped in 200 ml of distilled water for 1 hour at 30°C. Electrical resistance of the steep water was determined with a Serfass conductivity bridge, with 60-cycle current. For reducing-sugar determinations, three lots of 100 seed each were steeped in 50 ml of distilled water for 1 hour at 30°C. Relative differences in reducing-sugar content were estimated by the color developed when tubes containing 5 ml of steep water and 2.5 ml of Benedict's solution were heated in boiling water for 5 minutes. More precise determinations were made on some lots by the methods of Hawkins and Van Slyke and of Munson and Walker, as given by Hawk (*5*). Chromatographic analysis of sugars was made on water extracts from certain lots. In the cold test, 25 seeds from each lot were planted in naturally infested composted soil in each of four 1-qt cans. The soil was watered to field capacity. Cans were held at 10°C for 10 days and then at 20°C for 21 days.

Seed lots of each variety could be ranked as good, intermediate, or poor on the basis of color developed in the test with Benedict's solution. This reducing-sugar test was negative on water extracts from seed that produced the highest stands in the cold test. Steep water from the seeds of poorest quality gave a strong test and was found to contain as much as 0.1 percent of reducing sugar. Chromatograms showed both glucose and fructose to be present, with the latter predominant. A trace of sucrose was present in an extract from seed of extremely poor quality. Quantitative estimates of reducing sugar that were made from the chromatograms agreed with those obtained by the chemical methods. No arabinose, xylose, maltose, or ribose was detected.

Conductivity proved more rapid and precise than sugar determinations for predicting the relative performance of lots within a variety. Highly significant positive correlation coefficients (Table 1) were found within most varieties for the relation of electrical resistance readings and stands in the cold test. To make intervarietal comparison of seed lots did not appear possible.

In a second set of experiments, conductivity measurements were made on water extracts of seeds of 200 lots of the variety Baker 296 from commercial fields near Plainview, Tex. Seed weight also was determined from two 100-seed samples from each lot. Twenty-four seed lots, selected for a range of electrical resistance values, were tested simultaneously for cold-test reaction. Subsequently 29 similar lots, selected for a wider range of seed weights, were subjected to the cold test. Conductivity and cold-test procedures were the same as described above.

Highly significant correlation coefficients (Table 1) were found for the relation of electrical resistance and stand in the cold test. In the 29 commercial seed lots selected for a range of seed weights the correlation coefficient was higher when weight per 100 seeds was used as a third variable in partial correlation. Percent stands (Y)