Project 78-G2 Navel Orangeworm Research: Volatile Constituents of Almonds

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Cooperative efforts with Dr. Rice indicate that a bioassay-complicating relationship, the existence of which we had begun to suspect last year and which was hinted at in last year's report, may well exist. Two types of volatile emanations may be involved in NOW infestation of almonds: long range attractants that are highly volatile and released by the food substance apparently guide the NOW over considerable distances tothose food sources, but do not by themselves precipitate egg laying. Very short range ovipositioners that possess restricted volatility (and hence operate over extremely short distances) initiate egg laying and dictate precise egg placement.

This may have complicated our efforts to isolate the chemicals responsible for insect behavior. A highly purified ovipositional chemical might well yield negative results in bioassay because, unless a long-range attractant brings the moth within the limited distance over which the ovipositioner operates, she is unaware of its presence. We have now worked out bioassay techniques that permit the evaluation of these fractions in combination with a very restricted amount of bran bait. The latter serves as a source of long-range attractant and, in small lots, possesses limited ovipositional activity. Results obtained within the last few days indicate this approach is valid. Fractions from one of our preliminary separation techniques precipitate egg laying that is at least an order of magnitude higher than than encountered on control-bran baits.

The preliminary macro-fractionation techniques investigated to date include column chromatography, high pressure liquid chromatography and, more recently, thin layer and paper chromatography. It may well be that our first efforts, obtained with column and high pressure liquid chromatography, were confused because of these more effective separations. We may have been conducting bioassays on ovipositioners which were isolated from the long-range attractant so that insects were not brought into the restricted sphere of influence of the ovipositional chemical. Results from thin layer chromatography separations which have been performed in the last few days, and samples from which are presented with bran baits, have produced definitive results that look highly encouraging at this time.

For next year, we plan to continue these efforts and simultaneously utilize paper chromatography techniques that may permit direct bioassay of separated fractions without an intermediate recovery step. Those simplified fractions that demonstrate the highest ovipositional activity will then be analyzed by gas chromatography/mass spectrometry to identify their constituents. Components will then be purchased if available (and synthesized if not) and subjected to bioassay in combination with a source of long range attractant (e.g. bran bait or crushed almond hulls).