Environmental Health Perspectives
Vol. 14, pp. 103–107, 1976

Control and Management of Insect Populations by Chemosterilants

by Alexej B. Borkovec

Chemosterilants, i.e., chemical compounds that interfere with the reproduction potential of sexually reproducing organisms, can be used in three new approaches to insect control. In the sterile-insect release technique, the principal problem is to develop compounds and methods for their application that would not result in introducing harmful residues into the environment. Because of the unusual and often unique circumstances connected with releasing large numbers of sterilized insects, the residue problem and its cost-benefit aspects must be examined individually for each intended control or eradication program. In the direct application technique, chemosterilants must meet the same efficiency and safety standards required from approved insecticides. Combined insecticidal and sterilizing activity is characteristic for some compounds now being investigated. In the genetic technique, chemosterilants may be used for inducing heritable changes in the insect's genome under laboratory conditions, and such procedures would not present any residue problems. Only the first two chemosterilant techniques are approaching practical application, and their safety aspects require detailed evaluation and assessment.

All pests that compete with man for food and fiber and most of those that are parasites or carriers of diseases share a common characteristic: rapid reproduction. Indeed, many insects achieved the pest status primarily because their reproductive capacity was too high and their exploding populations exerted undesirable pressure on man's environment. In theory, any process that interferes with a pest's reproduction represents a potentially useful control method, but only a few such processes are sufficiently flexible and selective to become practical and competitive with established control procedures. The successful eradication of the screwworm, *Cochliomyia hominivorax* (Coquerel), from certain islands in the West Indies and from the southeastern United States (*1*) was a convincing example of a novel approach to pest control in which interference with reproduction played a key role.

Subsequent research sparked by these outstanding accomplishments and by the concern for environmental protection identified three major areas in which the sterility concept could be utilized: the sterile-male technique, in which artificially reared male insects would be sterilized by radiation or chemicals and released into infested areas; the direct sterilization technique, in which chemosterilants would be applied like insecticides to sterilize rather than to kill pest insects; and the genetic technique, in which special mutant strains would be released to suppress the natural population. The terminology of these techniques is imprecise and subject to personal preferences, but their common feature is interference with reproduction leading to reduction or extinction of the insect population. Chemosterilants, i.e., chemical compounds that reduce or eliminate the reproductive capacity of the organism to which they are applied (*2*), may be utilized in each of the three areas mentioned, though only in the direct sterilization technique are they essential and irreplaceable. In the other two techniques, sterilization by ionizing radiation is the most common alternative. In judging the present potential and the prospective uses of chemosterilants, their role in each specific technique must be clearly understood.

*Insect Chemosterilants Laboratory, ARS, U.S. Department of Agriculture, Beltsville, Maryland 20705.