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Genetic Sexing Research on Screwworms

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Interpretive Summary: Few changes have been made to the basic concepts for using Mendelian, or `Classical', genetic techniques to develop genetic sexing strains of insects since they were first developed in the 1960's. They have been attempted for several species of insect pests with few successes. Scientists at the USDA-ARS Midwest Livestock Insects Research Unit have been developing techniques applicable to `Classical' genetic approaches and, recently, have begun exploring the applicability of transgenic techniques for developing genetic sexing strains of screwworms. Linkage analysis has shown that genes responsible for several mutant lines are not near each other. Cytogenetic techniques are being rejuvenated for use in confirming results from both `classical' and transgenic approaches. Screwworms have been genetically transformed to express the Green Fluorescent Protein and the resultant transgenic strains appear to be as fit as `normal' strains. Further work is needed to determine screwworm specific lethality factors, sex determination factors must be defined, sex-specific lethality factors must be discovered, and an inducible/repressible mechanism must be developed before a reliable males-only, genetic sexing strain of screwworms can be developed for use in the mass rearing facility of the Program for the Eradication of Screwworms. Future research will emphasize developing transgenic techniques for screwworms through developing new collaborations to maximize resources.

Technical Abstract: Few changes have been made to the basic concepts for using Mendelian, or `Classical', genetic techniques to develop genetic sexing strains of insects since they were first developed in the 1960's. They have been attempted for several species of insect pests with few successes. Scientists at the USDA-ARS Midwest Livestock Insects Research Unit have been developing techniques applicable to `Classical' genetic approaches and, recently, have begun exploring the applicability of transgenic techniques for developing genetic sexing strains of screwworms. Linkage analysis has shown that genes responsible for several mutant lines are not near each other. Cytogenetic techniques are being rejuvenated for use in confirming results from both `classical' and transgenic approaches. Screwworms have been genetically transformed to express the Green Fluorescent Protein and the resultant transgenic strains appear to be as fit as `normal' strains. Further work is needed to determine screwworm specific lethality factors, sex determination factors must be defined, sex-specific lethality factors must be discovered, and an inducible/repressible mechanism must be developed before a reliable males-only, genetic sexing strain of screwworms can be developed for use in the mass rearing facility of the Program for the Eradication of Screwworms. Future research will emphasize developing transgenic techniques for screwworms through developing new collaborations to maximize resources.