Pests and Mosquitoes in Rice Fields

S-1029 has advanced rice pest management and mosquito control by identifying and developing safe, effective treatments and practices. This work helps safeguard rice yields and quality, enhance economic stability, and improve human and environmental health.

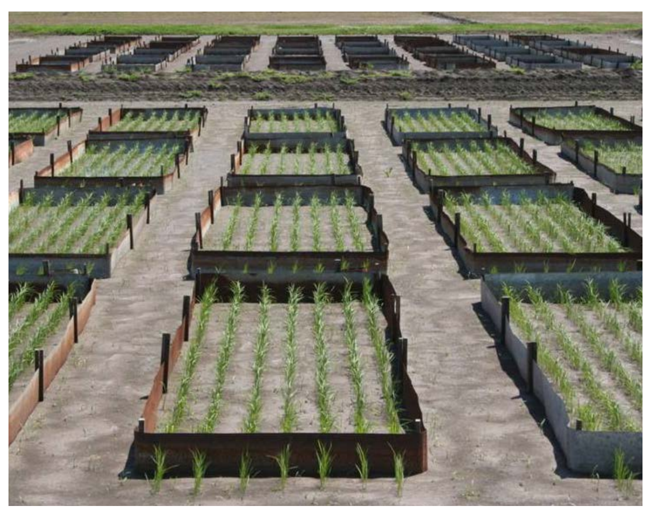
Who cares and why?

Insect pests can cause up to 50% yield and quality losses, posing a significant threat to the U.S. rice crop. Rice is a staple food crop, supports numerous industries, and provides essential wildlife habitat. Since the U.S. is one of the world's largest exporters of rice (in 2005, 3.3 million acres were planted and 40% of the crop was exported), ensuring good rice harvests promotes economic stability and food security at home and abroad. Rice growers, industries that rely on rice, pest control industries, public health groups, rural communities, and scientists are working diligently to effectively manage pests. However, some methods used to control rice pests can lead to outbreaks of mosquitoes by limiting predators and enhancing conditions and resources for mosquitoes. Mosquitoes that breed in rice fields are efficient vectors of diseases that threaten the health of humans, livestock, and wildlife. Uncontrolled mosquitoes can also reduce property values, cause labor problems, and hinder the tourist industry. Poor management that lacks coordination of control methods used by rice growers and mosquito abatement personnel can lead to lower rice yields, greater costs of production, environmental damage, and public health threats.

The sugarcane borer larva (left, photo by University of Florida) is a native insect pest of rice in the South. The fall armyworm larva (top middle, photo by Bart Drees, Texas A&M University) defoliates rice in the South. The rice water weevil (bottom middle, photo by Jack Kelly Clark, University of California) is the most serious insect pest of rice in the U.S., feeding on rice roots during larval stages. The South American rice miner (right, photo by Boris Castro, LSU AgCenter) has been documented in Louisiana and Texas. As a larva it feeds on seedling rice and can cause defoliation and crop yield losses.

What has the project done so far?

Changes in agronomic practices in U.S. rice production have been accelerating over the past two decades. The S-1029 group has kept pace with these changes by developing and implementing Integrated Pest Management (IPM) programs tailored to specific challenges. Project scientists have evaluated rice genes and identified rice varieties that are susceptible to specific pests. For example, California researchers have shown which rice varieties suffer highest crop yield losses from rice water weevils (RWW) and Arkansas research has led to the release of nine varieties of rice with competitive yield and stronger resistance to RWW. S-1029 members have also shed light on products and agricultural practices that help manage pests. In California, ring plot studies have shown that experimental materials, including etofenprox, indoxacarb, and clothianidin, have strong potential for RWW control. Arkansas scientists have found that keeping the permanent flood shallow for the first four weeks could reduce RWW infestation. Project members have also developed best management practices for seedling establishment. In California, researchers have demonstrated that the conventional water-seeded method best reduces leaf scarring from RWW adults and limits the presence of mosquito larvae. In Arkansas, Louisiana, and Texas, researchers have found that the pesticidal seed treatment, Dermacor X-100, can be an excellent chemical control option for RWW, fall armyworm, and stalk borer. S-1029 members have worked with the USA Rice Federation, EPA, and state



Rice research plots are surrounded by metal barriers to minimize movement of novel seed treatments, pesticides, and fertilizers among plots. Photo by Mo Way.

Impact Statements

Released rice varieties with higher pest tolerance and resistance, giving farmers alternatives to pesticides for ensuring good crop yield.

Enhanced knowledge of rice pest ecology, facilitating well-tailored control methods.

Monitored rice pests, helping growers lower costs and protect yields by heading off pest problems. In addition, S-1029 members were able to advise regulators that panicle rice mite is not a threat to U. S. rice.

Tested pesticides, seed treatments, and agricultural practices, informing growers how to protect rice yields and minimize chemical use, thus reducing grower costs, interference with mosquito control, and human and environmental health risks.

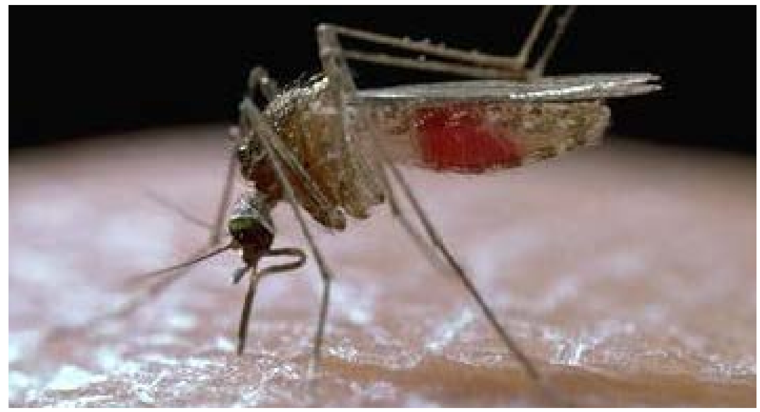
Yielded clues to the mechanism(s) of insecticide resistance, helping scientists and pest industries develop treatments that are effective in the long term.

Raised treatment thresholds for RWW and rice stink bug in Texas, leading to reduced pesticide use in the fragile rice agroecosystem.

Earned greater acceptance from wildlife managers, the public, and mosquito abatement agencies of chemicals that can be used for the control of mosquitoes when necessary to protect public health.

S-1029 members have been involved in many youth outreach efforts, including a summer camp where economically-disadvantaged, but academically-motivated middle school students learn math and science skills by conducting experiments on rice, sugarcane, and soybeans (above, photo by Mo Way). S-1029 member Mo Way developed a "Kit for Teaching Math and Science Using Agriculture and Entomology" for K-12 science teachers in southeastern Texas that was based largely on S-1029 research activities. To reach out to other stakeholders, S-1029 members have also distributed data sets and information via academic and trade journals and various extension outlets.

regulatory agencies to register new pest management tools. In response to public concerns, researchers have investigated the non-target and environmental impacts of chemical control of mosquitoes. S-1029 has also diligently monitored pest populations. As a result, Missouri researchers discovered tadpole shrimp infesting water-seeded rice fields. This is the first record of this pest in rice fields outside California and scientists have developed management guidelines to get early control of this.



S-1029 research has shed light on how to use pesticides and agricultural practices to control rice pests without fostering outbreaks of mosquitoes, which are found in and near rice fields and pose serious threats to human and animal health and reduce property values and tourism. Photo by Jack Kelly Clark, UC Davis.

What research is needed?

Research that continues to track the distribution of existing and emerging pests is needed, in addition to coordinated research to investigate the reasons why the RWW causes rice yield reductions in some states/areas, but not in others. Continued testing of new treatments and techniques and effective, long-term resistance management are keys to protecting the future of public health. Further work is needed to understand the relative efficacy of applying chemical pest control treatments by truck or air.

Want to know more?

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Compiled and designed by Sara Delheimer