

ANNUAL REPORT
COMPREHENSIVE RESEARCH ON RICE
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PROJECT TITLE: Implementation of Rice Blast Warning System

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OBJECTIVES AND EXPERIMENTS CONDUCTED BY LOCATION TO ACCOMPLISH OBJECTIVES:

The major objectives of the proposed research for 2001 were based upon the findings of research funded in 2000. The overall objective of this project was to develop and test the validity of rice blast models for use in California. The development of an effective and reliable rice blast model is necessary to provide growers with a valuable tool in making management decisions concerning fungicide applications.

Specific objectives of the proposed research:

1. Develop a rice blast field-scouting program with PCAs.
2. Collect weekly rice blast incidence data and develop disease progress curves.
3. Evaluate preliminary rice blast models using weather data and disease progress data.

Objective 1 – Develop a rice blast field-scouting program with PCAs. An aggressive field-scouting program was implemented with approximately twenty PCAs to increase the awareness of rice blast disease and detect disease occurrence as early as possible. FieldWise, Inc. provided instruction on identification of the various rice blast symptoms and the most efficient method of scouting for the disease. Instruction was provided in group sessions as well as one-on-one field consultations. Assistance with diagnosing disease samples was provided when needed and FieldWise personnel spent at least two days a week scouting fields for rice blast.

Objective 2 - Collect weekly rice blast incidence data and develop disease progress curves. PCAs participating in the field-scouting program were asked to be particularly watchful for early season leaf blast and notify FieldWise, Inc. of any possible rice blast symptoms. Each field with a suspected case of rice blast was visited within 24 hours to confirm or dismiss the presence of rice blast. As soon as FieldWise, Inc. confirmed the identity of rice blast in a field, disease monitoring began at that location. FieldWise, Inc. recorded the first observation and weekly rice blast progression for each field. These data were used to evaluate the accuracy of potential rice blast models.

Objective 3 - Evaluate preliminary rice blast models using weather data and field observations of rice blast. Several disease models were tested with weather data collected by FieldWise, Inc. over the past four years. Weather data were collected in nine rice fields during the 2001 season. Models were tested for their ability to predict conditions that favor the development of rice blast disease. Parameters were adjusted to achieve better prediction.

SUMMARY OF 2001 RESEARCH (MAJOR ACCOMPLISHMENTS) BY OBJECTIVE:

Objective 1 - Develop a rice blast field-scouting program with PCAs. With a concerted effort among an experienced group of PCAs and growers, fields were more closely scouted for rice blast throughout the season than in previous years. Early detection is a key element in making informed pest management decisions and these PCAs provided a valuable service to growers by participating in this program. The Air Resources Board disease certification program for burning was also responsible for increased field scouting toward the end of the season. Many PCAs stated that they scouted fields more closely this year than in the past and had a better understanding of the disease problems present in their fields. FieldWise personnel examined fields at least two days a week throughout Glenn, Colusa, Butte, Sutter, Yuba, Yolo and Tehama Counties. These scouting operations were often in conjunction with PCAs and/or growers and were directed at specific requests by these groups.

Objective 2 - Collect weekly rice blast incidence data and develop disease progress curves. Accurate disease progress curves are essential to the validation of a disease model. The first observation of rice blast during the 2001 season was made on August 22, approximately one month later than the first observations were reported in the previous couple of years. This first location is near Maxwell in Colusa County and this specific field has a history of rice blast in previous years. The second area of rice blast was reported October 8 west of I-5 in Glenn County between Willows and Maxwell. These are the only two areas FieldWise confirmed with rice blast this year and overall disease pressure appeared to be very low. The first case of rice blast was discovered after heading and most infections were complete at that time. The second case was discovered just prior to harvest.

The low level of rice blast this season and the late growth stage of reported fields did not provide sufficient data for disease progress curve generation. Possible reasons for the low disease incidence may be attributed to low levels of disease inoculum or cool night temperatures during mid to late season that may have provided less than optimal environmental conditions, slowing the development of rice blast.

Reports of rice blast, stem rot and aggregate sheath spot were provided weekly by FieldWise, Inc. on the rice information page sponsored by Syngenta and John Taylor Fertilizers at www.fieldwise.com and on the California Rice Disease Hotline sponsored by Syngenta.

Objective 3 - Evaluate preliminary rice blast models using weather data and field observations of rice blast. The effects of temperature, leaf wetness, relative humidity and precipitation may be used to develop a model to predict the risk of disease. FieldWise has tested several models used for similar diseases with the rice field weather data to determine if we can develop a model specific to rice blast in California. Parameters have been adjusted for the most promising model to more closely match the biological needs of the rice blast pathogen. Aside for the presence of fungal spores, the most limiting factor for rice blast in California is infection by the pathogen. This infection process requires an extended period of leafwetness and the extent of the leafwetness required is dependent upon the temperature during this period. Our model calculates the average temperature over each leafwetness period and then assigns a daily disease index based upon the leafwetness period that is weighted by temperature. There is an optimum temperature for infection, so leafwetness periods that occur during higher or lower than optimal temperatures are given less weight than periods accompanied by optimal temperatures. The disease index generated by this model indicates when environmental conditions are favorable for infection by the rice blast pathogen if spores are present (Figure 1). Scouting will still be required to determine if rice blast lesions are within a field or in surrounding fields that may provide inoculum when conditions are favorable for infection. This model is still experimental and will require validation but should be useful in detecting periods favorable for infection by the rice blast pathogen.

CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:

Scouting reports combined with the evaluation of weather conditions and weather forecasts allowed us to provide growers and PCAs with a weekly assessment of the relative risk of rice blast infections. This information was made available on the FieldWise, Inc. web site and also on the Syngenta Rice Disease Hotline. Nine weather stations in rice were part of a larger weather station network, operated by FieldWise, Inc., that covered a large part of the Sacramento Valley and included data collection stations in tomato, grape, walnut and almond. This regional network provides data for daily updated weather forecasts and maps depicting the previous day's weather conditions (maximum and minimum temperature, average relative humidity and precipitation).

Results of this research indicate that monitoring rice blast with the help of a PCA and grower scouting program was useful in determining the extent of rice blast incidence in the Sacramento Valley. Much more ground was covered and fields were examined more closely than in previous years for disease incidence and severity. Observations of rice blast in only two areas in Glenn and Colusa Counties indicate that rice blast disease pressure was quite low this year.

Collection of one more year of weather data has provided a key tool in developing a model for rice blast prediction in California. An experimental model has been developed to evaluate conditions favorable for infection by the rice blast pathogen. This model relies on an evaluation of leafwetness and temperature during the leafwetness period to generate a daily rice blast disease index. These two parameters are most important in determining the likelihood of infection by the pathogen when spores are present.

Development of a rice blast model for California will assist in evaluating the risk of disease development as rice plants approach the heading stage. Just prior to heading is the critical time to decide if a fungicide application is warranted. Preliminary indications are that the modified model may be useful in predicting rice blast infection periods. Intense field scouting will still be required to determine if rice blast lesions are within a field or in surrounding fields that may provide inoculum when conditions are favorable for infection.

Figure 1. Example of data from experimental model for rice blast. The model considers duration of leafwetness and temperature during leafwetness to calculate a disease index value. The disease index generated by this model indicates when environmental conditions are favorable for infection by the rice blast pathogen if spores are present. Conditions are considered favorable for infection when the disease index is ≥ 13 and highly favorable when the index is ≥ 16 .

