

# COMPREHENSIVE RESEARCH ON RICE

Annual Report -- 1974

Project Number and Title: RP-1 Weed Control in Rice.

Project Leader: David E. Bayer

Personnel: R. Baskett, M. Brandon, B. Fischer, B. Hess, C. Wick, J. Williams.

## Objectives:

1. To develop safe, effective and economical weed control measures for rice production in California.
  - a. Evaluate new promising herbicides.
  - b. Develop detailed procedures for the safe use of herbicides showing promise for controlling weeds under California rice growing conditions.
  - c. Determine fate of these herbicides in the rice cultural environment.
2. Determine the time and extent of damage and yield loss caused by various infestations of weeds.

## Work in Progress:

Laboratory and Greenhouse research on benthocarb (Bolero<sup>R</sup>) has been conducted to complete details necessary to make meaningful suggestions on how the grower can use the herbicide most effectively. Benthocarb is taken up primarily by the shoot of the plant. However, root uptake is more important with this herbicide than with molinate. Research has indicated that rice plants in the 3-leaf stage with roots established in the soil will tolerate herbicidal rates. This normally corresponds to the growth stage of rice plants under grower condition of 7 to 10 days after seeding. Studies are presently underway to evaluate the influence of temperature on the phytotoxicity of benthocarb on germination and developing rice seedlings during this early stage of growth. Other laboratory studies on rice herbicides includes evaluations on soil mobility both lateral movement and leaching, adsorption and desorption.

The problem of excessive burn and injury to the rice plant following applications of MCPA is being investigated. This problem is not the same as the leaf tip burn generally observed following MCPA application in association with high temperatures.

Bentazon, a postemergence broadleaved herbicide for cattail control is being evaluated to determine the most efficient method of application. In addition to the control of cattail this herbicide is of interest for use in situations where MCPA can not be used or where it may be an advantage to use a less hazardous herbicide.

#### Experiments Completed:

Four primary screening trials were conducted, two preemergence and two post-emergence. The postemergence trials involved several dates of application. One preemergence and one postemergence screening trial was conducted at U.C. Davis Rice Facility and the second was conducted in Fresno County in cooperation with Bill Fischer, Farm Advisor and Norval Davis, Grower, Firebaugh. Seventeen new potential herbicides plus seven promising herbicides from last years trial were evaluated.

Expanded studies were continued for the development of the most promising herbicides, benthocarb, bromoxynil, bentazon, Drepamon, and perfluidone (Destun<sup>R</sup>). Residue samples of rice grain and straw were collected for participating companies to assist in there label registration. In addition to these studies trials at two locations were established using higher rates and combination of rates and dates of application to assist in a label change that would increase the allowable use rates for molinate. Data including residue samples were furnished the company to assist with their petition for a change of label.

Of particular interest is the possible use of bentazon for cattail control in rice. Data from this years trials suggests bentazon may be applied over a fairly long period without injury to the rice plant and still provide good control of cattails. Although bifonex (Modoum<sup>R</sup>) looked promising as a broad spectrum herbicide it has become evident that the potential for injury to the rice plant is too great at rates necessary for good weed control. However, when used on drilled rice it has provided excellent weed control without injury.

Three weed control trials were established on drilled rice in cooperation with Dr. Mikkelsen to evaluate possible herbicides that would allow an evaluation of this cultural practice under California conditions. Two herbicides bifonex and butralin showed good promise for broad spectrum weed control under these conditions without injury to the rice.

Studies were established to evaluate glyphosate for spot treatment of perennial weeds such as cattail and kelp as a late fall or spring treatment in fields to be planted to rice. Trials were also established to evaluate its use as a herbicide for levee weed control. Besides weed control and crop injury evaluations, residue samples of soil water and plants were collected at various intervals.

#### Work Planned:

Herbicide screening trials will be continued using both preemergence and post-emergence applications. The primary objective will be to search for a broad spectrum herbicide that will control both broadleaved and grass weeds. These trials will be conducted at U.C. Davis Rice Facility and in Fresno County in cooperation with Bill Fischer, Farm Advisor.

Developmental trials will be conducted to determine details of proper timing, rates of application, disappearance from soil and/or water, etc. Phytotoxicity of the herbicides to major crops growing in close association with rice will be evaluated. Assistance will be given chemical companies needing special studies for product registration.

Laboratory and greenhouse studies will be conducted to aid in developing the most efficient use of the herbicide. These will include site of uptake studies, volatility, absorption, adsorption, leaching, etc. studies.

Studies on the dissipation of herbicides in rice flood water will continue.

Competition from weeds on yield of rice will continue to be investigated. Two aspects will be given attention. 1) The effect of various levels of weed infestations on rice yields. 2) Stage of growth of the rice plant most susceptible to competition from the weed infestation. Control measures will be studied in relation to the time the weed plant exerts its greatest impact on the rice plant.

#### Major Accomplishments:

Details necessary for expanded trials leading to full scale field use of benthicarb has been completed. The best weed control with least rice injury will result from applications made 10 to 12 days after seeding or 14 to 16 days following flooding. This corresponds to the 2 to 3 leaf stage of the rice plant and the 1 to 2 leaf stage of the barnyardgrass.

Preemergence applications of benthicarb does not provide as satisfactory weed control as the postemergence treatments. Soil incorporation tends to increase weed control providing the seed bed is free of large clods and incorporation is thorough and complete and sufficient herbicide is applied to allow for dilution due to depth of incorporation. Benthicarb has relatively limited mobility in the soil making it necessary to have a very fine seedbed free of clods.

Bentazon showed real promise for the control of cattails in rice. Postemergence applications made at varying stages of growth gave satisfactory control. However, best control seemed to correspond to the treatments made later in the season. No injury to the rice plant was noted at any of the dates of application regardless of the stage of development or at twice the rates necessary for cattail control. It should be emphasized that cattails in this trial germinated and became established this season and whether old established plants growing from a previous years infestation can be controlled will be evaluated during the coming growing season.

Although bifonex is a broad spectrum herbicide, it does not have sufficient safety to be able to be used for weed control in rice with California's water-seeded rice culture. Sufficient safety does exist, however, when rice is drilled and allowed to germinate and emerge from the soil before a permanent flood is established.

Further conformation of the results reported in the 1973 annual report on bromoxynil was developed. This herbicide continued to look promising for broad-leaved weed and sedge control. Data and residue samples were collected for the label petition which would include this use on their present label. For best weed control the herbicide must be applied when the weeds are young and small. This suggests for best results the water should be lowered to expose the maximum amount of weed foliage. Rates of 0.5 pounds per acre are needed to provide satisfactory weed control. No injury to the rice plant has been noted from these rates.

Cooperative studies with the Department of Agricultural Engineering on ways to apply propanil safely was conducted and will be reported under that project.

Further data was collected on the competitive effects of barnyardgrass on rice. Weed infestations of 2 to 4 plants per square yard will affect rice yields. Of equal importance is the stage of development of the rice plant most responsive to the competitive effect of barnyardgrass. This period corresponds to the first 30 to 35 days after seeding.

#### Immediately Applicable Research Results:

As soon as benthocarb, bromoxynil, bentazon and glyphosate becomes available for grower use details on how and when to use it will be available for growers. Information on barnyardgrass competition will help the grower decide when and if he should apply a herbicide.

#### Evaluation of Project:

The growers are realizing benefits from their accelerated research program in weed control primarily in ways to use the herbicides they have more effectively. The program has been assisting the chemical industry develop new herbicides for the growers. These are beginning to become available to the growers and more will be available in the immediate future. Cooperative research with other Departments is providing a dimension that is helping integrate the weed control program into the overall rice production program.

#### Publications or Reports:

- Report to Rice Growers, 1974.
- Report at Biggs Rice Field Day, 1974.
- Report at County Meeting, 1974.
- 1973 Rice Weed Control Report.