

FLORIDA AGRICULTURAL INFORMATION RETRIEVAL SYSTEM; A COMPUTERIZED CROP MANAGEMENT PROGRAM WITH APPLICATION TO TOMATOES¹

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Abstract. The Florida Agricultural Information Retrieval System (FAIRS), a computerized library of information from the Cooperative Extension Service, has been developed to improve communication of extension information. The system provides tools which permit extension service personnel to rapidly develop and distribute extension recommendations and other agricultural production information. The tomato, *Lycopersicon esculentum* Mill., portion of the system is outlined in an extensive multilevel index covering all aspects of tomato production including variety selection, insects, diseases, weeds, nematodes, pesticides, soils and fertilizers, water and irrigation, harvest and postharvest operations and economics.

The publication and distribution of extension information has grown to be a laborious task. Most of the existing information is difficult for users such as county agents and growers to locate if it is available, and difficult for the extension service to keep up-to-date. FAIRS (Florida Agricultural Information Retrieval Systems) is a unique computer technology designed to help individuals with the task of disseminating and using agricultural extension information.

FAIRS is a computerized database of all pertinent extension information available for a particular crop or other area of agricultural production. Under an initial development phase which began in 1981 (4), FAIRS has been constructed for soybeans, citrus (2) and tomatoes. FAIRS is being distributed to county agent offices and, on an experimental basis, to growers who connect to a computer at their county agent's office via telephone using their own microcomputers (2). The county agent offices are linked together with a statewide computer network under development by IFAS (6). FAIRS includes a special program called an authoring system which is used to construct databases in various subject areas. The authoring system permits computer displays of text and graphics to be generated easily, and allows creation of menus and means for organizing data

into coherent programs. It uses simple instructions, and can be operated after just 1 or 2 training sessions. The authoring system is now being used successfully by dozens of extension workers. It allows the database to be constructed directly by those who are familiar with the subject matter, eliminating the need for a specially trained programmer. Use of FAIRS to develop a database for tomatoes is described below.

Materials and Methods

Work on the tomato database began in the spring of 1982 and is scheduled for completion by the end of 1983. Currently the database contains over 2000 displays of information. The program is now undergoing testing and field evaluation.

A database on tomatoes was constructed from available extension literature, such as bulletins and fact sheets, and from unpublished sources. Personnel at the Institute of Food and Agricultural Sciences (IFAS) in Gainesville, and at IFAS Agricultural Research and Education Centers in Bradenton and Homestead, Florida assisted in gathering data and building the database. A crop coordinator was designated to identify the types of information to be included in the tomato database, and to help gather the necessary data from extension subject specialists. An index of topics (Fig. 1) defined the major subject headings. Existing extension publications such as the Florida Pest Control Guides (1, 3, 5, 7) served as a basis for selecting topics for the database. Most of the information which was available in extension publications is now included in the system. Additional topics not available in publication form were selected and developed by the crop coordinator.

After the data have been gathered, editorial assistants working with the extension subject specialists reorganized the material into final reports. These reports were entered into the computer using the authoring system. A review for subject accuracy and technical content was conducted prior to releasing the reports over the IFAS computer network.

Results and Discussion

A user can locate information in the tomato database by selecting desired items from a menu (Fig. 1). Information is presented in the form of tables, text or graphic illustrations (Fig. 2). Extensive cross-referencing allows the user

FLORIDA TOMATOES MAIN INDEX	
TYPE A LETTER TO REVIEW A SUBJECT:	
a	Florida Tomato Industry
b	Botany of Tomatoes
c	Key for General Crop Disorders
d	Land Selection and Preparation
e	Mulching Systems
f	Water Management
g	Varieties
h	Insects
i	Diseases
j	Weeds
k	Nematodes
l	Integrated Pest Management
m	Postharvest Operations
Press SPACE BAR for Main Index.	

Fig. 1. Main index to the tomato database.

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PREPLANT, POSTEMERGENT - CHLORAMBEN RATES FOR MULCHED TOMATOES
➔TYPE A LETTER TO CHOOSE A TOPIC:
<input type="checkbox"/> a = chloramben
RATE (lbs.a.i./acre): 3.0
TRADE <input type="checkbox"/> b = Amiben (Amchem) <input type="checkbox"/> c = Amiben NAMES: (Union) <input type="checkbox"/> d = Amiben Granular (Amchem) <input type="checkbox"/> e = Amiben Granular (Union)
REMARKS: 24C (Special Local Needs) label for Florida only. Controls germ- inating annuals. Apply once per season while forming bed shoulders or after existing weeds in row middles are removed.
TYPE <input checked="" type="checkbox"/> for TOMATO WEED CONTROL INDEX.

Fig. 2. Example of a display in the tomato database.

to examine all information of relevance to a particular topic. We will explore the content of the tomato database by examining each of the major topic areas.

Florida tomato industry. This section gives an overview of the tomato industry in Florida, describes various production methods in use, and gives statistics on production levels such as the number of acres planted. The relation of the tomato industry to Florida and United States agriculture is explored. Future trends in production and consumption levels are projected. Information is also provided on various organizations involved in tomato production throughout Florida.

Botany of tomatoes. This includes the history and origins of tomato cultivation. Growth habits of the plant are described, including stages of development. Descriptions of plant parts are also made. Plant anatomy is illustrated by use of computer graphics. An analysis of the chemical composition of fruit is also given.

Key to general tomato crop disorders. This section is designed as an aid for diagnosing general crop problems. It is based on commonly occurring symptoms which can be readily observed in the field, for example, wilted plants or discolored fruit. Extensive cross-referencing is used to list all possible causes associated with a symptom. The causes include such things as nutritional deficiencies, abiotic stress factors, pest damage, or damage from machinery or chemical applications. The symptoms are classified by plant part affected (e.g. fruit, leaf, stem).

Land selection and preparation. The economic and horticultural considerations in selecting and preparing land to grow tomatoes are discussed. Sequential steps in land preparation and labor requirements are given for various tomato growing regions around the state.

Mulching systems. The advantages of the full-bed mulching system are given along with the details on design and layout of mulched tomato beds. Special nutrition and water management methods for the mulching system are identified. The theory behind the success of mulching system is described in terms of nutrient and moisture gradients.

Water management. This section discusses the water requirements of tomatoes. Tolerance of, sensitivity to and symptoms related to water stress are identified. Determination of soil moisture content and evapotranspiration, and characteristics of Florida climate of importance to irrigation such as temperature, rainfall and evapotranspiration rates are described. These data are used to estimate irrigation requirements for tomatoes. Historical averages of the amount of irrigation applied to tomatoes in Florida are reported. Finally, a discussion of water quality and conservation is given.

Varieties. Specific information is provided on leading tomato varieties. Characteristics covered include foliage and

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growth habits, fruit quality and yield, disease resistance and tolerance, and planting and maturation dates. In addition, comparisons among varieties are made on the basis of fruit quality, disease resistance and yield. Results of Florida variety trials are presented for comparison of yield characteristics.

Insects. The major insect pests of tomatoes are identified with detailed information on their physical appearance, biology and control. A key for identifying insect specimens is included specifically for those insects found in tomatoes. Control recommendations are provided for over 30 common and sporadic insect pests of tomatoes.

Diseases. This section contains details on symptoms, biology, factors favorable for development, and cultural and chemical control methods for 24 major tomato diseases. A general disease prevention plan outlines measures to be applied in a sequential fashion at various times during the growing season. A special index of pesticides used for control of tomato diseases gives information on recommended products. Finally, a disease identification key provides assistance in diagnosing diseases based on observable field symptoms. Another such key is based on microscopic examination of disease spores.

Weeds. The main emphasis of this section is on herbicide recommendations. These are organized according to the stage of growth of the crop and the particular weed to be controlled. Recommendations also differ for mulched versus non-mulched tomatoes. An index is provided which lists recommended herbicides and product information by trade name and by active ingredient. In addition to these recommendations, an identification key for common weed grasses is provided. Keys for broadleaf weeds and sedges will be developed in the future.

Nematodes. This section provides a complete treatment of nematode management beginning with identification of nematodes by use of above-ground symptoms, examination of root galls and distorted root symptoms, and by use of soil samples. A list of the principle tomato nematode pests is provided along with descriptions of their biology and life history. Cultural and chemical nematode control recommendations are also given. A list of recommended nematocides provides access to information on specific products.

Integrated pest management. This section provides general information oriented towards field scouting which can be used with the other sections on pest management just described. Details of field scouting procedures currently in use on tomatoes throughout Florida (e.g. number of samples to take, how to select sample sites) are given. Control action thresholds for the major tomato pests are provided for interpretation of scouting data. Finally, a description of the commercial scouting business is given with details on the field training, time and materials needed for consulting work in scouting.

Postharvest operations. Methods, equipment and procedures for ripening tomatoes using ethylene are described. This section also discusses prevention of disease through proper sanitation in the packinghouse.

Currently, this computerized database is one of the most comprehensive sources of information about Florida tomato production available to county agents and growers. There are plans to add to the database as the need arises. We are encouraging all sectors of the tomato producing community to use this database and to provide comments so that this program can be tailored to their specific needs.

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