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CHEMSEARCH: A SEARCHABLE PESTICIDE DATABASE FOR TROPICAL FRUIT CROPS

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Abstract. **The University of Florida, Institute of Food and Agricultural Sciences is completing a pilot project during which selected faculty members evaluated the efficacy of ChemSearch, a commercial database created by Crop Data Management Systems, Inc. (CDMS) for making up-to-date pesticide recommendations. This project led to a national initiative by CDMS to provide ChemSearch at reduced cost to university and government institutions. ChemSearch is the industry's premier searchable database for agricultural chemicals and contains product label information for over 1,600 crop protection and special products, including 24Cs, Section 18s and Supplemental Labels. ChemSearch is updated daily, easy to learn, and searchable by crop, pests, active ingredient, state, etc. to provide a label summary. The ChemSearch database was searched for pesticides currently registered for tropical fruit crops in Florida, e.g., avocado, banana, carambola, guava, lychee, mango, papaya, mamey sapote, and others. The number of available insecticides, fungicides, and herbicides were compared and representative examples will be presented for selected tropical fruit crops. Finally, tips will be provided for easily conducting rapid and comprehensive searches of the ChemSearch database.**

Integrated pest management (IPM) for tropical fruit crops depends on a range of pesticide options that can be used with other tactics, such as cultural and biological control. Development of these pesticides is warranted because the production of tropical fruit is a significant regional industry in the southern peninsula of Florida, with approximately 1000 tropical fruit operations in the state worth an estimated $170 million to the economy. Directly or indirectly, 3000 to 4000 people are employed in supplying the regional and national ethnic market demand for these high value crops (Mossler and Nesheim, 2003). However, a report on projects for tropical fruit by USDA, CSREES, Interregional Research Project No. 4 (IR-4) stated, "few pest control chemicals are registered for use in tropical fruit crop orchards" (Meister, 1987). Subsequent IR-4 reports reaffirmed the dearth of pesticides for tropical fruit crops (Lamberts and Crane, 1990; IR-4, 2005) and a recent USDA Pest Management Strategic Plan prepared by the University of Florida in cooperation with industry representatives reemphasized this need (Mossler and Nesheim, 2003).

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In addition to a lack of pesticides, there have been difficulties in accessing and interpreting information on managing pests of tropical fruit (Peña, 2002): "Information regarding proper timing, spray volumes and knowledge of the pest complex differs among tropical fruit. While solid information is available for some crops like pineapple, it is disregarded for others, e.g., papaya. Widespread use of nonselective pesticides continues to be the rule, but currently there is a trend towards evaluating a new generation of pesticides, adoption of selective spraying, proper timing of spray applications, and determining the effect of pesticides on predators and parasitoids." The problem of obtaining accurate information is further exacerbated for growers and Extension personnel who must select pesticides for multiple species of tropical fruit.

Pesticide Database Evaluation

To help provide timely information on pest management, regardless of crop, the *IPM Florida* at UF/IFAS surveyed the needs of county Extension agents involved with pest management (http://ipm.ifas.ufl.edu). Of the respondents, 86% indicated that they needed a source of current information on pesticide availability and use for their clientele, e.g., chemicals registered for use on specific crops. Some of the individuals indicated a strong desire for electronic resources that support IPM. In response, *IPM Florida* staff researched commercial pesticide databases, including greenbook.net (http://www. greenbook.net), Pest-Bank (http://www.ovid. com), and ChemSearch (http://www.cdms.net) (Table 1). ChemSearch, an electronic source of information on the availability and use of registered pesticides produced by Crop Data Management Systems, Inc. (CDMS), was selected for further testing. It is both comprehensive and user friendly.

Pesticides Registered for Tropical Fruit IPM

We used ChemSearch to rapidly conduct an online search for pesticides that can be used in tropical fruit crops. A considerable number of herbicides, insecticides and fungicides were listed but apparently growers, Extension personnel and crop consultants have not had ready access to the full extent

Table 1. Comparison of electronic pesticide databases.

ChemSearch	Greenbook.net	Pest-Bank
Updated daily	Updated daily	Updated quarterly
Data from 90+ manufacturers	Data from 40+ manufacturers	EPA is data source
Easy to use	Fairly easy to use, more limiting than ChemSearch	Must learn; Silver Platter language to search
Can e-mail results of searches	No	Can e-mail results of searches
Quick access to information	Quick access to information	Need to look at labels individually for specifics
Search by specific state	Cannot limit to state	Can limit to specific state, once learn language

of this information. The ChemSearch database contained entries for 924 herbicides, 802 insecticides, and 553 fungicides registered for use on various tropical fruit (Table 2). The actual number of products, rather than number of entries, is lower due to multiple fruit having the same registration. The database was evaluated for content of Florida minor crop pesticide information, specifically the following tropical fruit: atemoya, sugar apple, avocado, banana, plantain, Barbados cherry (acerola), black sapote, carambola, guava, jackfruit, Tahiti lime, key lime, kumquat, pummelo, lychee, longan, mamey sapote, mango, papaya, passion fruit, sapodilla, wax jambu, white sapote. The choice of fruits corresponded to those in the UF, IFAS publication "Pesticides Registered for Tropical Fruit Crops in Florida" (Crane and Mossler 2005). For each fruit, searches were conducted for herbicide, insecticide, and fungicide product types, limited only by fruit name and a State of Florida registered use.

Besides the considerable number of tropical fruit registrations found in ChemSearch, we noted that closely related fruits generally had very similar search results, but they were not always identical. Atemoya and sugar apple are very closely related fruits, though separate species, and they were similar in their ChemSearch listings. Each contained one fungicide not common to the other, resulting in 23 brands of fungicides if combined. Each pesticide listed for "plantain" was also listed for "banana," a closely related fruit, but banana had others not listed for plantain. Similarly, all of the results for longan were found in the listing for its better-known relative the lychee, but lychee had some additional products, especially fungicides. Thus, it appears that closely related species were generally considered in the pesticide registration process.

Table 2. The number of distinct pesticide product entries generated for each tropical fruit crop.

	Pesticides		
Crop	Herbicides	Insecticides	Fungicides
Atemoya	38	19	22
Sugar apple	38	19	22
Avocado	66	58	37
Banana	45	32	43
Plantain	44	16	17
Barbados cherry	0	0	0
Acerola	40	20	7
Black sapote	18	19	8
Carambola/Starfruit	38	20	22
Guava	49	24	23
Jackfruit	37	16	5
Tahiti lime	0	0	0
Key lime	0	0	0
Limes	72	119	53
Kumquats	76	113	50
Pummelo	70	108	49
Lychee/Litchi	38	23	23
Longan	38	21	7
Mamey sapote	18	19	23
Mango	40	32	45
Papaya	49	41	53
Passion fruit	39	26	25
Sapodilla	38	21	8
Wax jambu	16	18	5
White sapote	17	18	6
Total pesticide entries	924	802	553

We also noted that the ChemSearch database has a structural characteristic that must be considered when conducting searches. Crop names in the ChemSearch database are listed exactly as specified on the label by the manufacturer. This creates a potential search problem in ChemSearch that is less common in vegetable or agronomic crops with one widely accepted common name, but has been noted in ornamentals (J. Popenoe, Woody Ornamentals Extension Agent, UF/IFAS, pers. comm.). Generally, the common name of the crop is used rather than the scientific name. Unfortunately, tropical fruit often have multiple common names or multiple English spellings of foreign names. Hence, the "Barbados cherry" (a name for *Malpighia glabra* Millsp. used by Crane and Mossler, 2002), had no listings under that name but, when the alternate name "acerola" was used, 40 herbicides, 20 insecticides and 7 fungicides were found. "Carambola" and "starfruit" are common names for *Averrhoa carambola* L. By searching "carambola" we found 37, 16, and 18 herbicides, insecticides and fungicides, respectively, while a search for "starfruit" yielded 16, 18, and 8 herbicides, insecticides and fungicides respectively, for the fruit (*Chrysophyllum cainito* L., or "star apple" is occasionally, but rarely, also called "starfruit" and not likely to be listed as such on a pesticide label). The terms "Tahiti lime" and "key lime" do not appear in the ChemSearch database but both are included under "limes." Searching under two spellings of the same name "litchi" and "lychee" was required to find all the listings for *Litchi chinensis* Sonn. The herbicide and insecticide options are smaller with the term "litchi," but the fungicide listing increased significantly using the term "litchi" over "lychee."

ChemSearch

The ChemSearch website contains a subscription database of agricultural chemical and specialty products that enables users to search across the label information of over 90 company's products. Each manufacturer under contract with CDMS supplies labels for the database. CDMS breaks the label information into database fields. Before the information actually goes online, the product manufacturer approves the information for release to users. This ensures that the information presented by CDMS to ChemSearch subscribers has the affirmation of the manufacturer. The data in ChemSearch is updated daily, with approximately 10% "turning over" monthly.

ChemSearch allows a user to search by state, crop, pest, chemical, brand name, or product type. Product types include herbicide, insecticide, fungicide, growth regulator, adjuvant, nutrient, attractant/pheromone, rodenticide, feeding stimulant/bait, and desiccant/defoliant. After selecting a product name or type, a search can be further limited by crop, state, manufacturer, and up to four pests. Results are always presented by product name. Multiple versions of the same product family, e.g., Applaud 70DF IGR and Applaud 70WP IGR, are treated as separate products. Users have the option of viewing various types and formats of information. Full-color label files can be viewed and read. All applicable versions of the product label are presented, including 24Cs, Section 18s and Supplemental Labels. Alternatively, a summary of the label information can be viewed (http://www. cdms. net/CSPromo2.asp). The summary is presented in a standard format for all products. The summary format allows quick comparisons of products that may have very different label formats. Also available

are Material Safety Data Sheets (MSDS), Department of Transportation shipping descriptions, and SARA Title III hazardous substances information for compliance with the Emergency Planning and the Community Right-to-Know Act.

A one-year pilot test of ChemSearch began on 1 July 2004, in collaboration with the UF, IFAS Office of the Dean for Extension and Pesticide Information Office, and included all 67 county Extension offices and other appropriate IFAS units, a total of 96 subscriptions. The objective of the test was to provide faculty members who make pesticide recommendations with rapid, online access to information about registered pesticides. The test was intended to complement the work of the Pesticide Information Office and Extension specialists, and support the IFAS Pest Management Guides. A significant result of this project was a decision by CDMS to provide ChemSearch at reduced cost to university and government institutions nationwide.

Pesticide Databases and IPM

IPM is based on the integration of tactics to maintain pest populations below acceptable damage thresholds, e.g., cultural practices, biological control, chemical pesticides and physical methods. Consequently, it is essential to select efficacious and cost effective pesticides that fit the crop production and pest management system. Selection of appropriate pesticides requires accurate identification of the pests and specific knowledge about their biology. A pesticide's effect on beneficial species, human health, and the environmental should also be taken into account. Managing pesticide resistance is especially difficult with few pesticides available for rotational use on minor crops. Pesticide selection has become more complicated as older chemicals were withdrawn from the market and new ones were introduced in an effort to reduce effects on non-target organisms. Fortunately, internet-accessible databases, such as ChemSearch, provide access to much of the information necessary to select and use the best pesticides for IPM.

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