

# Figs Knowledge Based System Disease Diagnosis and Treatment

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**Abstract: Background:** Figs are a unique fruit resembling a teardrop. They're about the size of your thumb, filled with hundreds of tiny seeds, and have an edible purple or green peel. The flesh of the fruit is pink and has a mild, sweet taste. The scientific name for the fig is *Ficus carica*. As rewarding as they are frustrating, figs are commonly troubled by several fungal diseases, as well as the odd bacteria or virus. Knowing how to recognize fig tree diseases can help keep you one step ahead of garden disaster. Let's learn more about some of the most common fig issues affecting these fruit trees. **Objectives:** The main goal of this expert system is to get the appropriate diagnosis of disease and the correct treatment. **Methods:** In this paper, the design of the proposed Expert System was produced to help Farmers and those interested in agriculture in diagnosing many of the Fig diseases such as rust, Anthracnose wilt, Leaf spot, Leaf mosaic (virus), Alternaria rot, Aspergillus rot, Smut, Fig mosaic, Leaf Blight. The proposed expert system presents an overview of fig diseases are given, the cause of diseases outlined and the treatment of disease whenever possible is given out. CLIPS Expert System language was used for designing and implementing the proposed expert system. **Results:** The proposed Fig diseases diagnosis expert system was evaluated by Agricultural Students at AL Azhar University and some friends interested in agriculture and they were satisfied with its performance. **Conclusions:** The proposed expert system is very useful for Farmers and those interested in agriculture.

**Keywords:** Figs, Fruit, Expert System, Knowledge Based Systems

## 1. INTRODUCTION:

Fig is a perennial herb with very fragrant, toothed leaves and tiny purple, pink, or white flowers. There are many varieties of Fig—all fragrant, whether shiny or fuzzy, smooth or crinkled, bright green or variegated. However, you can always tell a member of the Fig family by its square stem. Rolling it between your fingers, you'll notice a pungent scent and think of candy, sweet teas, or maybe even Fig juleps.

As well as kitchen companions, Figs are used as garden accents, ground covers, air fresheners, and herbal medicines. They're as beautiful as they are functional, and they're foolproof to grow, thriving in sun and shade all over North America. Since Fig can be vigorous spreaders, you simply have to be careful where you plant it.

Agriculture specialists do not treat Fig diseases in many places. The presence of specialists to treat plant diseases in general and Fig, in particular, is rare in the greatest parts of the world. Plant diseases in general and Fig, in particular, are very common these days because due to the industrial revolution, climate changes, and other impacts.

Diagnosis of Fig diseases is very complex because the symptoms on their plants make them a lake, which makes them stand up to an important question of whether these symptoms are a disease or an insect or a deficiency in an element. So they need Specialists in Plant Diseases with wide experience of Fig diseases. For all the aforementioned reasons, we have developed this expert system to help in diagnosing many of the Fig diseases, in order to prescribe the appropriate treatment [16]. An expert system is a computer application of Artificial Intelligence (AI) [2,4,6]; which contains a knowledge base and an inference engine [3]; the main components and details are represented in Figure 2.

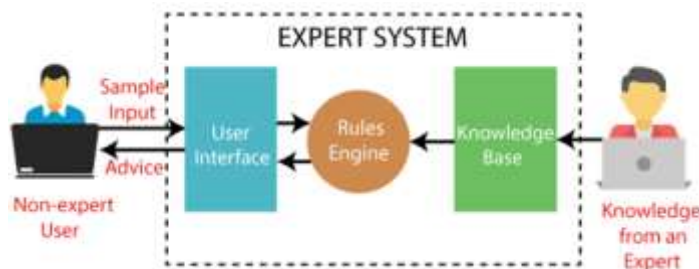


Figure 2: The figure presents the Main Components of an Expert System, Designed by the authors

The proposed Expert System for Fig Diseases Diagnosis was implemented using, CLIPS Rule-Based Programming Language. It is a forward chinning reasoning expert system that can make inferences about facts of the world using rules and take appropriate actions as a result. The Interface of the expert system is implemented in Delphi Embarcadero RAD Studio XE6 [8]. It's easy for the knowledge engineer to build the Expert System and for the end users when they use the system.

## 2. MATERIALS AND METHODS

The proposed expert system performs diagnosis for seven Fig diseases by Diagnosis of symptoms. The proposed expert system will ask the user to choose Symptoms on each screen. At the end of the dialogue session, the proposed expert system provides the diagnosis and recommendation of the disease to the user. Figure 3 shows a sample dialogue between the expert system and the user. Figure 4 shows how the users get the diagnosis and recommendation.

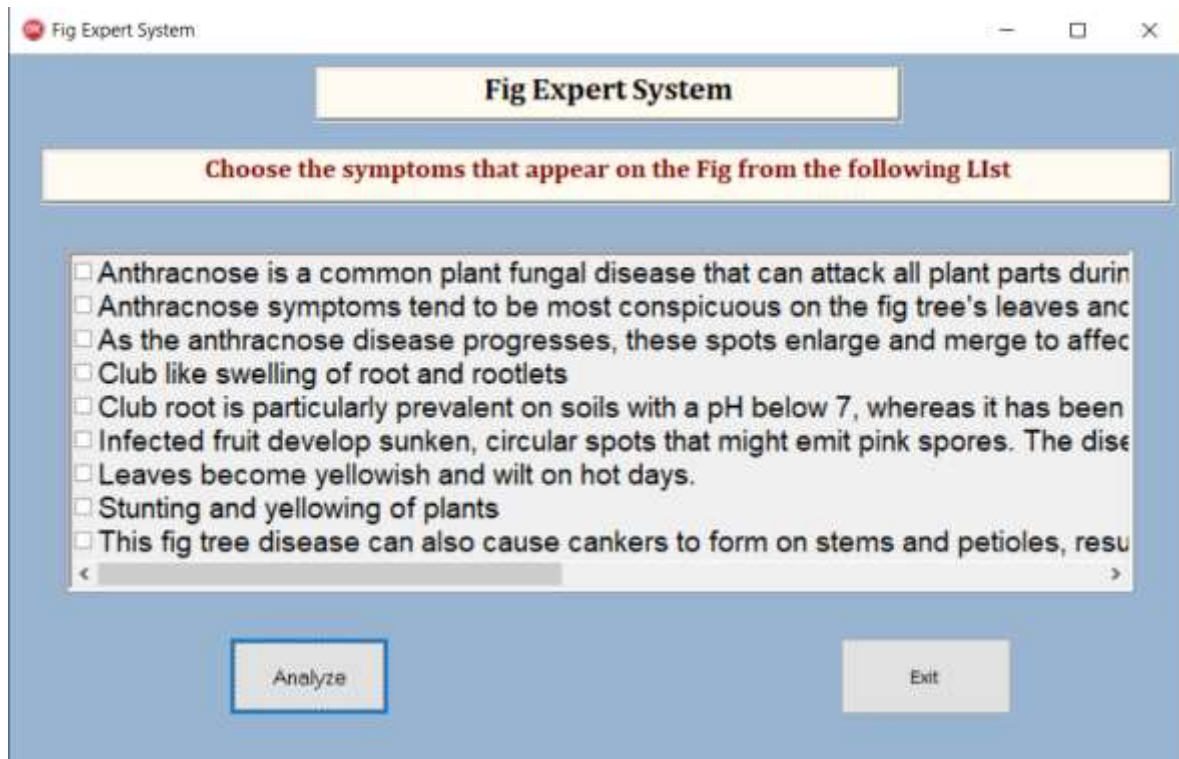


Figure 3: The figure shows symptoms of diseases the user.

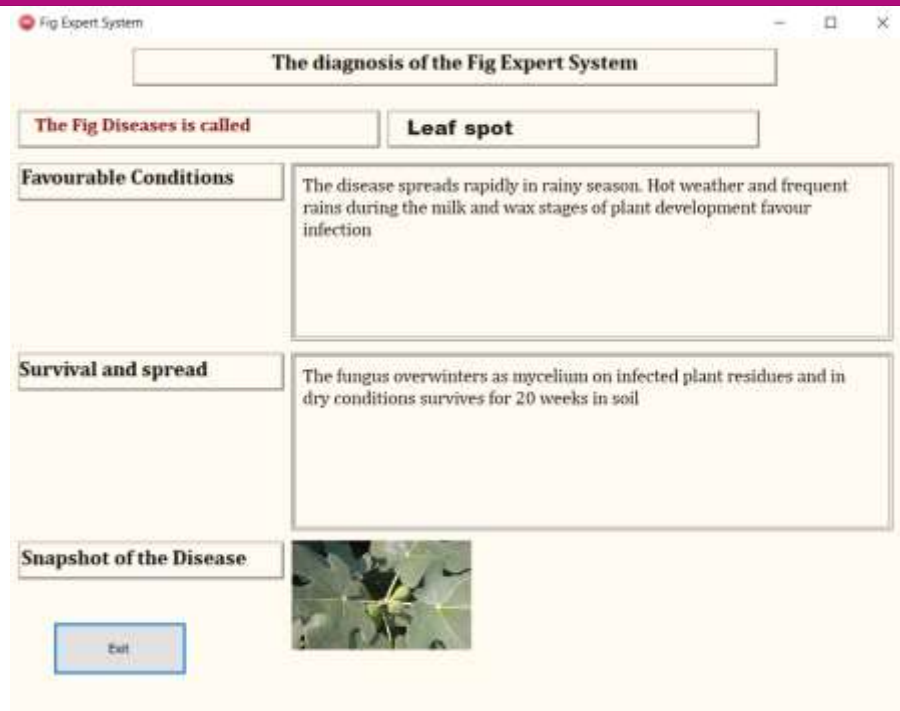


Figure 4: The figure shows diagnosis and recommendation of the expert system.

### 3. LITERATURE REVIEW:

#### 3.1 Previous Studies

There are many expert systems developed in agriculture [2-25;71-90] like: papaya plant disease diagnosis, grapes diagnosis and treatment, onion rule based system for disorders diagnosis and treatment, diagnosing tobacco diseases, banana knowledge based system diagnosis and treatment, spinach expert system: diseases and symptoms, knowledge based system for apple problems using clips, diagnosing banana disorders, black pepper expert system, knowledge based system for diagnosing guava problems, an expert system for citrus diseases diagnosis, expert system for sesame diseases diagnosis, expert system for the diagnosis of mango diseases, expert system for diagnosing sugarcane diseases, expert system for the diagnosis of wheat diseases, coffee diseases, diagnosing and treating potatoes problems, safflower disease diagnosis and treatment, castor diseases and diagnosis, coconut diseases diagnosis, plant disease diagnosis, and apple trees.

There are many expert systems implemented for educations [26-28], like: guiding freshman students in selecting a major in Al-Azhar University, selecting exploratory factor analysis procedures, calculating inheritance in Islam. In general health [29-65] like: anemia expert system diagnosis, diagnosing coronavirus (covid-19), short-term abdominal pain (stomach pain) diagnosis and treatment, diagnosing breast cancer, diagnosing skin cancer, ankle problems, hip problems, hair loss diagnosis, chest pain in infants and children, diagnosis of dengue disease, high blood pressure, ankle diseases, thyroid problems, problems of teeth and gums, diagnosing cough problem, lower back pain, rickets diagnoses and treatment, neck pain diagnosis, diagnosing facial-swelling, throat problems, kidney, depression diagnosis, diabetes diagnosis, polymyalgia rheumatic, silicosis, endocrine diagnosis and treatments, arthritis diseases diagnosis, hepatitis, diagnosis of seventh nerve inflammation (bell's palsy) disease, knee problems diagnosis, and uveitis disease diagnosis. In control [69-70,] like: modeling and controlling smart traffic light system. In maintenance [66-68], like: photo copier maintenance, desktop pc troubleshooting, and diagnosing wireless connection problems.

#### 3.2 Comments about previous studies

Although, there are many expert systems in agriculture field, there are no expert system for diagnosing Figs diseases and treatment. That is why we are proposing an expert system for diagnosing and treating Figs problems.

#### 4. KNOWLEDGE REPRESENTATION:

The main sources of knowledge for this expert system are farmers and specialized websites for Plant Diseases. The captured knowledge has been converted into CLIPS Rule-Based Programming Language (Facts, and Rules) [7]. Currently, the expert system has 28 rules, which cover seven Fig diseases:

**Fig rust:** is a fungus disease that attacks young leaves. At first the fungus appears as small, yellow to yellow-green spots on the leaves that enlarge and produce a brownish tinge as they spread over most of the leaf. On the undersides of leaves are small blisters or pustules. Over time, the leaf will yellow then turn a rusty brown at the leaf margin, curl up, and then the plant will defoliate.



**Figure 5:** The figure shows Fig rust disease.

The cause may be for this disease is the presence of these four conditions:

- Rust generally develops late in the summer, and in years when disease is severe, it can cause the trees to defoliate in a matter of a few weeks. If this happens on a regular basis, the overall growth of the trees can be reduced and yields can be affected.
- Another consequence of defoliation is that if it occurs early in the summer, the trees will put out new growth that is then at risk of being damaged by early frosts. On the other hand, if defoliation occurs in the fall, the trees may go dormant earlier than usual, which then protects them from early frosts.
- Initially, symptoms of fig rust are visible as small, yellowish spots on the upper surface of the leaves. As these spots (or lesions) grow larger, they turn a reddish-brown color but remain relatively smooth.
- On the lower surface of the leaf, the lesions are a reddish-brown color and have a slightly raised, blister-like appearance. Heavily infected leaves often turn yellow or brown, particularly around the edges, and drop prematurely.

**Fig anthracnose:** is a disease caused by the fungus *Glomerella cingulata*. It attacks the leaves and the fruit of fig trees. Fig anthracnose symptoms include fruit that rots and drops prematurely as well as immature fruit that shrivels and never drops from the tree. The fruit will have sunken spots that are discolored.



**Figure 6:** The figure shows Fig anthracnose disease.

The cause may be for this disease is the presence of these five conditions:

- Anthracnose is a common plant fungal disease that can attack all plant parts during any growth stage.
- Anthracnose symptoms tend to be most conspicuous on the fig tree's leaves and ripe fruits. Anthracnose first appears on leaves as small black, yellow or brown spots.
- As the anthracnose disease progresses, these spots enlarge and merge to affect entire areas.
- This fig tree disease can also cause cankers to form on stems and petioles, resulting in severe defoliation and root rot.
- Infected fruit develop sunken, circular spots that might emit pink spores. The disease can be controlled by spraying aureofungin at 40 ppm in soap solution + 20 ppm CuSO<sub>4</sub>.

**Mosaic disease (FMD)**, is a complex viral disease with which 12 viruses, including a confirmed causal agent, fig mosaic emaravirus (FMV), and three viroids are associated worldwide. FMD was first described in California in the early 1930s. Symptoms include foliar chlorosis, deformation, and mosaic patterns.



**Figure 7:** The figure shows Mosaic disease (FMD) disease.

The cause may be for this disease is the presence of these two conditions:

- Small, olive-green specks or sunken yellow-olive lesions covered in green spores on fruit.
- Water-soaked areas on fruit surface where figs touch.

## 5. LIMITATIONS:

The currently proposed expert system is specialized in the diagnosis of only the following three Fig diseases: Fig rust, Fig anthracnose, Mosaic disease (FMD).

## 6. SYSTEM EVALUATION:

As a preliminary evolution, some students at the College of Agriculture and some interested in agriculture tested this proposed Expert System and they were satisfied with its performance, efficiency, user interface, and ease of use.

## 7. CONCLUSION:

In this paper, a proposed expert system was presented for helping Farmers and those interested in agriculture. Fig may suffer from three different diseases they have. Farmers and those interested in agriculture can get the diagnosis faster and more accurately than the traditional diagnosis. This expert system does not need intensive training to be used; it is easy to use and has a user-friendly interface. It was developed using CLIPS Rule-Based Programming Language.

## 8. FUTURE WORK:

This expert system is considered to be a base for future ones; more Fig diseases are planned to be added to make it more accessible to users from anywhere at any time.

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