# Grapes Expert System Diagnosis and Treatment

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*Abstract: This research included the design of a preliminary expert system that helps farmers and specialists diagnose and provide appropriate advice on grape diseases. In addition, knowledge management used in the expert system was discussed. One of the essential elements of this research was to find the appropriate language for the diagnosis of grapevine and the current status in the knowledge base. Expert systems have been used to be able to effectively implement consultation and production rules to capture knowledge. The expert system was developed using CLIPS with the Delphi language interface. The expert system produced good results in the analysis of grape cases that have been tested and enable the system to determine the correct diagnosis in all cases..*

**Keysowrds:** Rule Based, Grapes , CLIPS, Delphi

## 1. INTRODUCTION

Grapes fruit, soft, heart, juice, grow on the vine. Fruits appear in groups where there are usually six types of fruit and three hundred fruits. The color of the bouquets of different varieties and colors in black, blue, violet or dark color and tend to green or white. Figure 1a shows grape leaves, and Figure 1b shows the fruit of the grapes.



**Figure1a: grape leaves**



**Figure1b:** The grapes

Grape is an important crop on all continents with global production of gradual increase in production. Internationals are not treated in the cultivation of grapes in many places. In fact, the presence of specialists and specialized centers for the treatment of accident diseases is rare in most parts of the world. Grape diseases are very common these days. Diagnosis of infection diseases is very complex. So they need specialists with extensive experience in grape diseases. For all of the above reasons, we have developed this expert system to assist specialists and farmers to diagnose many disease cases, in order to prescribe appropriate treatment. An expert system is an artificial intelligence application; contains a knowledge base and a conclusion engine; the components and basic details are represented in Figure 2.



**Figure 2**: The figure presents the Main Components of an Expert System [22].

1. The proposed system of experts for the diagnosis of grape diseases using the CLIPS language has been implemented. It is a system of foresight that can draw conclusions about the realities of the world using rules and things and take appropriate action as a result. The CLIPS system performs any expert system across the interfaces. It is easy for a knowledge engineer to build a system of experts and end users when they use the system

## 2. MATERIALS AND METHODS

The proposed system of experts will diagnose 14 onion diseases by presenting all problems. The proposed system of experts will ask the user to choose the type of problem. At the end of the dialogue session, the proposed expert system provides diagnosis and recommendations for the user. Figure

3 shows the main interface of the system and the user system. Figure 4 shows disease, Figure 5 Obtain diagnosis and recommendation.
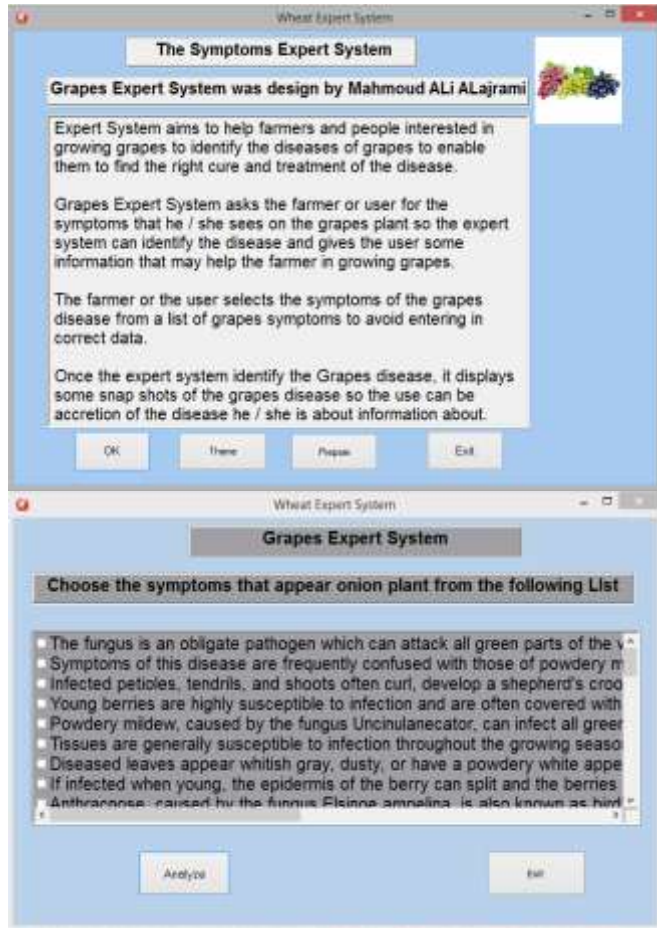


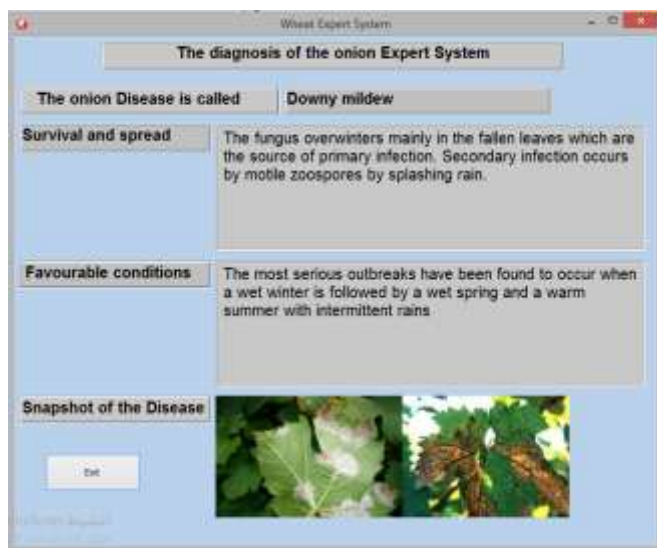**Figure 4**: Displays the disease interface.



**Figure 5**: Displays the diagnostic interface and recommendations.

# 3. LITERATURE REVIEW

There are many expert systems designed to diagnose agricultural diseases such as apple bananas and other diseases. However, there is no expert system to diagnose diseases available for free. A few authors have developed an expert system to help farmers and clinicians diagnose diseases using CLIPS [18, 19]. The current expert system specializes in the diagnosis of grape diseases: mold, anthracene mold, green fungus, bacteria spot, alternative blight, black mold, mold, blue mold, black mold, green mold, rotor mold, mold gray mold Botrytis.

# 4. KNOWLEDGE REPRESENTATION

The main sources of knowledge for this expert system are vikaspedia [19] and a specialized site for agricultural diseases. The captured knowledge was converted to the structure of the Clips database (rules and object rules). The system of experts currently contains 41 bases covering 14 grape diseases [14]:

a) **Downy mildew :** The fungus is an obligate pathogen which can attack all green parts of the vine. Symptoms of this disease are frequently confused with those of powdery mildew. Infected leaves develop pale yellow-green lesions which gradually turn brown. Severely infected leaves often drop prematurely. Infected petioles, tendrils, and shoots often curl, develop a shepherd's crook, and eventually turn brown and die. Young berries are highly susceptible to infection and are often covered with white fruiting structures of the fungus. Infected older berries of white cultivars may turn dull gray-green, whereas those of black cultivars turn pinkish red.



**Figure 6** : shows Downy mildew.

b) **Powdery mildew:** Powdery mildew, caused by the fungus Uncinulanecator, can infect all green tissues of the grapevine.Tissues are generally susceptible to infection throughout the growing season. Diseased leaves appear whitish gray, dusty, or have a powdery white appearance. Petioles, cluster stems, and green shoots often look distorted or stunted. Berries can be infected until their sugar content reaches about 8%. If infected when young, the epidermis of the berry can split and the berries dry up or rot. When older berries are infected, a netlike pattern often develops

on the surface of the berry.. Figure 7: shows the disease of Powdery mildew.



**Figure 7:** shows the disease of Powdery mildew

c) **Anthracnose :** Anthracnose, caused by the fungus Elsinoe ampelina, is also known as bird's-eye rot from its appearance on the fruit.The disease appears first as dark red spots on the berry. Later, these spots are circular, sunken, ashy-gray and in late stages these spots are surrounded by a dark margin which gives it the "bird's-eye rot" appearance. The spots vary in size from 1/4 inch in diameter to about half the fruit. The fungus also attacks shoots, tendrils, petioles, leaf veins, and fruit stems. Numerous spots sometimes occur on the young shoots. These spots may unite and girdle the stem, causing death of the tips. Spots on petioles and leaves cause them to curl or become distorted. Figure 8: shows the disease of Anthracnose



**Figure 8:** shows the disease of Anthracnose

d) **Greenaria bitter rot:** This fungus can infect all green parts of the vine including leaves, tendrils, new shoots, as well as berries. However, mature leaves and ripe fruit are not susceptible. Infections of leaves first appear as red spots on the upper leaf surface in late spring. These circular spots enlarge and become tan to light brown with distinct, dark borders. Small, pinpoint black fruiting structures of the fungus often develop in the centers of these spots. Most serious damage usually occurs on the berries. On the fruit, infections first appear as whitish spots which enlarge to sunken areas with dark borders. Significant infections usually occur when the grape is pea-size or larger. As infection progresses, the fruit becomes black, wrinkled, mummified, and look like raisins. Infected grapes often shatter,leaving only the stem.



**Figure 9**: shows the disease of Greenaria bitter rot .

e) **Bacterial leaf spot :** The young growing shoots are affected first. Disease infects leaves, shoots and berries. The symptoms appear as minute water soaked spots on the lower surface of the leaves along the main and lateral veins. Later on these spots coalescr and form larger patches. Brownish black lesions are formed onthe berries, which later become small and shriveled.
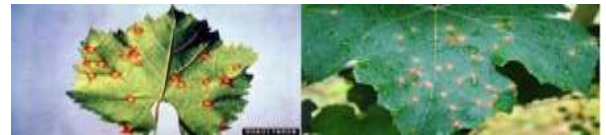


**Figure 10:** shows the disease Bacterial leaf spot .

f) **Alternaria blight:** The disease attacks both leaves and fruits. Small yellowish spots first appear along the leaf margins, which gradually enlarge and turn into brownish patches with concentric rings. Severe infection leads to drying and defoliation of leaves. Symptoms in the form of dark brown-purplish patches appear on the infected berries, rachis and bunch stalk just below its attachment with the shoots.



**Figure 11:** shows the disease of Alternaria blight .

g) **Black rot :** The disease attacks the leaves, stem, flowers and berries. All the new growth on the vineis prone to attack during the growing season. The symptoms are in the form of irregularly shapedreddish brown spots on the leaves and a black scab on berries. Occasionally, small elliptical darkcoloured canker lesions occur on the young stems and tendrils. Leaf, cane and tendril infection canoccur only when the tissue is young, but berries can be infected until almost fully-grown if an activefungicide residue is not present. The affected

berries shrivel and become hard black mummies. Figure 12**:** shows the disease **Black rot** .



**Figure 12:** shows the disease of Black rot.

h) **Blue mould rot** : Scanty growth - white and turn bluish green are seen. Decay the berries. Infected tissues become soft and watery. Infected berries emit a mouldy flavor. The fungus covers whole berries and it looks like bluish green in colour.
Figure 13: shows the disease of Black mould.



**Figure 13**: shows the disease of Blue mould rot.

i) **Black mould rot :** It is a post-harvest disease. The fungus enters the berries through the injuries caused due to poor post-harvest handling operations. The pulp of infected berries is reduced is reduced to watery consistency. Berries look black in colour.



**Figure 14 :** shows the disease of Black mould rot.

**Green mould rot :** It is a post-harvest disease. The fungus enters the berries through the injuries caused due to poor post-harvest handling operations.

Infected berries are discolored yellowish green, and affected fruits shrivel. Masses of powdery green spores generally covered the bunch of grapes.
. Figure 15: shows the disease Green mould rot



**Figure 15**: shows the disease of Green mould rot.

j) **Rhizopus rot:** Round irregular, light brown and water soaked lesion appear on fruits. Decaying fruits emits fermented, moudly smell.Conidia aseptate, small and globose It is a post-harvest disease. Under warm and moist conditions the fungus grows rapidly producing acoarse grey mat of mycelium. Injury caused to the berries by tight packing and storage temperaturehelp the fungus grown during storage. If the infected berries are trimmed at harvest, it does not occurafter harvest under ideal storage conditions. Figure 16: shows the disease of Rhizopus rot.



**Figure 16**: shows the disease of Rhizopus rot [19].

k) **Botrytis bunch rot or gray mold:** One or more berries of a cluster show signs of decay just before harvest. The decay may progress to include most of the berries in a cluster. The infected fruit may become covered with a grayish-tan powder containing the spores of the fungus. Berry stems and cluster stems may be invaded, causing them to shrivel.When the fungus decays berries low in sugar, the rotting berry has a sour odor and taste.If the berries are nearly mature and have a high sugar content, the decaying berry is quite firm, dry, and somewhat sweetish to the taste. Berries that have split or have been punctured often are attacked by other organisms, resulting in a sour or moldy decay. Figure 17: shows the disease of Botrytis bunch rot or gray mold [21].

**Figure 17:** shows the disease of Botrytis bunch rot or gray mold.

l) **Rust**: The symptoms are in the form of numerous orange coloured pustules on the lower surface of the leaves. In case of severe infection such pustules cover the entire leaf surface leading to severe defoliation.. Figure 18: shows the disease of Rust [13].



**Figure 18**: shows the disease of Rust [19].

m) **Foot rot :**[21] Roots show black, sunken, necrotic lesions. In cross section, the base of the trunk appears necrotic and xylem vessels may be black in colour. Leaves may appear to be water stressed or scorched, and vines may be stunted and/or killed. Cylindrocarpon may occur in combination with other plant pathogens.. Figure 19**:** shows the disease of Foot rot**.**



**Figure 19:** shows the disease of Bacterial brown rot.

## 5. LIMITATIONS

The current system of experts specializes in diagnosing only the following 14 diseases: Downy mildew , Powdery mildew , Anthracnose, Greenaria bitter rot, Bacterial leaf spot, Alternaria blight, Black rot, Blue mould rot ,Black mould rot, Green mould rot, Rhizopus rot ,Botrytis bunch rot or gray mold, Rust, Foot rot

## 6. EVALUATION SYSTEM

As a preliminary development, the students of the Faculty of Agriculture at Al-Quds Open University and the students of the Faculty of Agriculture at Al-Azhar University tested this proposed system and were satisfied with its performance, efficiency, user interface and ease of use.

## 7. CONCLUSION

In this paper, a proposed expert system was introduced to help farmers and students diagnose grapes. Farmers and students can get a faster and more accurate diagnosis than traditional diagnosis. This expert system does not require extensive training to use; it is easy to use and has an easy-to-use interface. The proposed expert system has been developed using the CLIPS and Delphi languages.

This expert system is the basis for the future. It is planned to add more grape diseases and make them easier for users from anywhere and anytime.
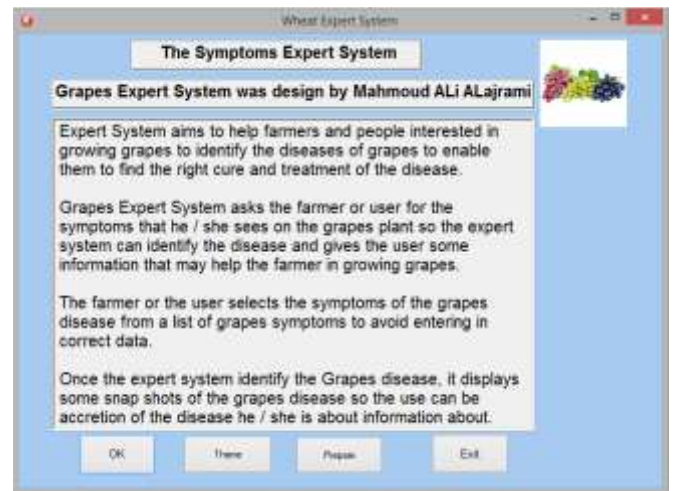
## 8. EXPERT SYSTEM IMAGES



**Figure 20:** The main screen format of the expert system.



**Figure 21:** Add Info screen for the main interface



**Figure 22:** Main interface adjustment screen

**Figure 23:** Screen Modifying Interface Results.
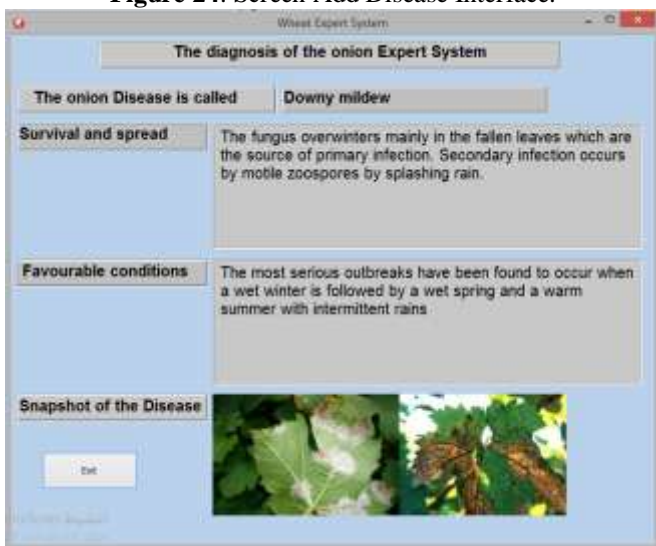


**Figure 24**: Screen Add Disease Interface.



**Figure 25**: Screen of the result

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