

Web based Soybean Disease Expert System

Dr. Savita Kolhe, Senior Scientist (Computer Application),
Dr. G. K. Gupta, Principal Scientist (Plant Pathology)
ICAR-Directorate of Soybean Research,
Khandwa Road, Indore (M.P)-452001

In different parts of the country more than 100 diseases have been reported to inflict soybean crop, thirty-five of them are important in India. The insect-pests and diseases together cause yield losses to the extent of 32% in soybean crop. Annual yield losses due to these diseases in the country are nearly 12 percent of the total production. World wide annual yield losses from diseases alone in soybean are approximately 10-30 percent of the total production. Therefore, one has to be proactive to diagnose so as to protect and manage soybean crop. This will prevent the soybean crop from the devastating diseases that leads to high yield losses.

The experts for disease management are limited in numbers throughout the country and also they are not easily available at times of need. So, to facilitate the extension workers, farmer advisors and the growers to diagnose and take appropriate course of management, a fuzzy-logic based on-line disease expert system for soybean is developed at Directorate of Soybean Research, Indore, India (Fig. 1). This system helps in identification of twenty five soybean diseases. The system is developed using ASP .NET technology of Microsoft Visual Studio .NET. The knowledge on twenty five soybean diseases is stored in the form of knowledge base developed using SQL Server. The main user interface of the system consists of –i) Disease Knowledge Acquisition System ii) Intelligent Disease Tutor System iii) Expert Disease Diagnosis System.

EXPERT SYSTEM for Crop Disease

HOME | INTELLIGENT TUTOR | CONTACT | ABOUT US | DSR HOME

An Ultimate Expert Decision....

WELCOME TO THE EXPERT SYSTEM

MEMBERS LOGIN

EXPERT SYSTEM

KNOWLEDGE ACQUISITION

Register now

IMAGE GALLERY

EXPERT SYSTEM

The expert system helps in making correct disease diagnosis and suggesting appropriate management practice to control the disease at right time at right place in right form in very low cost. It helps a user to make a right decision when a disease infection is observed in the farmers fields. It also serves as an expert disease tutor.

KNOWLEDGE ACQUISITION

The Knowledge Acquisition Subsystem helps in the accumulation, transfer and transformation of crop disease diagnosis expertise from disease expert or documented knowledge source like disease compendiums, books, scientific papers, disease bulletins, internet web resource and photograph concerning the diseases.

The system provides a user friendly web-based graphical user interface to create crop disease knowledge bases and its efficient management.

Home | About Us | Contact | DSR Home

Developed by Dr. Savita Kolhe, Scientist(Computer Applications)
CopyRight© Directorate of Soybean Research, Khandwa Road, Indore (M.P.) - 452001, All Rights Reserved.

Fig. 1 Home page of Expert System for Soybean Disease Diagnosis

Disease Knowledge Acquisition System

The Expert System for Soybean diseases has a Knowledge Acquisition System (Fig. 2) for efficient handling of the soybean disease knowledge during the entire process of knowledge engineering. Knowledge engineering is the process of building the knowledge base for an Expert system. The knowledge engineering includes steps for knowledge acquisition, classification, representation, processing and final storage. This system provides a strong and reliable knowledgebase support for the Expert System of Soybean diseases.

EXPERT SYSTEM FOR CROP DISEASE
Welcome to the Knowledge Acquisition Subsystem: Home Expert System About Us Contact
KNOWLEDGE ACQUISITION SUBSYSTEM
Master Entry > Disease Rules > Disease Detail >
Disease Name Expand Disease Detail
Disease Information
Disease Picture
IN
To add new ATTRIBUTE NAME press ADD button. Write new ATTRIBUTE NAME in textbox and then press SAVE button else press CANCEL button.
To edit the existing ATTRIBUTE NAME first select the ATTRIBUTE NAME press EDIT button. Enter the ATTRIBUTE NAME in textbox and then press UPDATE button else press CANCEL button.
To delete the existing ATTRIBUTE NAME first select the ATTRIBUTE NAME press DELETE button. Then press OK button else press CANCEL button.

ATTRIBUTE ENTRY
ATTRIBUTE ID: AD
ATTRIBUTE NAME: ----Select Item----
ADD EDIT DELETE

Home About Us Contact
Developed by Dr. Savita Kolhe, Scientist(Computer Applications)
CopyRight© Directorate of Soybean Research, Khandwa Road, Indore (M.P.) - 452001, All Rights Reserved.
Phone:+91-0731-2362835, 2364879, 2478414(Adm) Fax: 2470520

Fig. 2 The Knowledge Acquisition Subsystem of the soybean disease expert system.

Intelligent Disease Tutor System

Intelligent Soybean Disease Tutor System (Fig. 3) is a subsystem of Expert System of Soybean diseases. It serves as an audio-visual soybean disease training tool. It provides the soybean disease information on useful disease related aspects like pathogen, geographic distribution, economic impact, favorable climatic conditions, detection methods and effective integrated management of practices. It is a very useful and interactive audio-visual training tool for providing pathological trainings with the help of multimedia effects, color pictures, videos, texts, and graphics with capability of text-to-voice interface.

Intelligent Disease Tutor
DSR Home IIS Home KAS Home Contact About Us New Registration
:: Welcome to Intelligent Disease Tutor Subsystem ::
REGISTERED SUBSCRIBERS SIGN IN
Crop Name : Soybean
User Name :
Password :
Sign In

Fig. 3 Main web page of Intelligent Disease Tutor.

Expert Disease Diagnosis System

This is the main system which provides a user interface for diagnosing soybean diseases using the intelligence of soybean disease experts. It uses the knowledge base developed with the help of knowledge acquisition system to get the knowledge of diseases to give proper diagnostic decisions. It uses the inference engine containing – i) computerized inference technique based on the heuristic knowledge of disease experts, ii) fuzzy logic for efficiently handling uncertainty iii) disease case studies iv) statistical methods. The expert system identifies the disease based on the disease symptom inputs given by the user as shown in Fig. 4.

The screenshot shows the 'Expert System for Crop Disease' web interface. At the top, there is a green navigation bar with the ICAR logo on the left and links for HOME, INTELLIGENT TUTOR, CONTACT, ABOUT US, and ES HOME on the right. A 'Welcome admin' message is displayed in the top right corner. Below the navigation bar, there is a 'Logout' link. The main content area is divided into several sections. On the left, there is a section titled 'Select the part affected of the Infected plant' with two options: 'Plant' and 'Stem', each with a 'SELECT' button. Below this is a section titled 'Selected symptoms for the diagnosis' which lists three symptoms: 'Plant shows wilting', 'Plant shows stunted growth', and 'Plant shows weakness'. To the right of this is a section titled 'Select the symptoms' with a list of 18 symptoms, each with a checkbox and an 'Audio' link. The checked symptoms are 'Plant shows wilting?', 'Plant shows stunted growth?', and 'Plant shows weakness?'. At the bottom left of the main content area, there is a yellow button labeled 'Disease Diagnosis'. At the bottom right, there is a yellow button labeled 'Save'. At the very bottom of the page, there is a green footer bar with the text 'Home About Us Contact Administrator Developed By'.

Fig. 4 Web page showing disease symptom inputs by the user.

The disease symptoms are provided based on the infected part of the plant like Plant, leaves, stem, root etc. With this input system finally identifies the disease and provide a suitable control measure to manage it using the Inference Engine that stores the complete inference drawing expert logic. The user has the facility to get the detail information of the diagnosed disease to gain more knowledge. The user can also see the inference technique used by the system to reach to the diagnostic decision.

The system is available at our institute website <http://www.dsrindore.org>. This real-time on-line disease diagnosis system for soybean can help soybean growers in disease diagnosis, in taking appropriate quick decision /judgment in real time field conditions by harnessing the analytical and decision-making capabilities of disease experts. The real-time application of the system can minimize yield losses due to massive disease attacks to a great extent by providing awareness of pre-disposing climatic factors, making the exact diagnosis and management expertise available on WWW at right time at right place in the right form at minimum cost. It can also be used as a consultation tool and a good source of knowledge for farmers/cultivars, agriculture advisors/extension workers, researchers, managers and farmers' advisory agencies like Kisan Call Centres, Agricultural Technology Information Centres, E-Choupaals etc.
