

Decision Support System Development for Resistant Wheat Varieties

Suman Lata*, M.S.Saharan , Indu Sharma , Megha Chaudhary

Directorate of Wheat Research Karnal-132001 India

Corresponding author email: slata66a@yahoo.com

ABSTRACT: Wheat is one of the first crops known to have been domesticated that can be cultivated on a large scale providing long term storage of seed and is used for human food and livestock feed. While selecting wheat varieties for growing in different agro climatic zones, along with the yield, the disease resistance of variety is an important factor to be considered. Wheat rust disease database developed at DWR is a step towards this activity. Out of all wheat diseases, yellow rust causes maximum damage to the crop. So while making decision about variety, yellow rust resistance must be considered on priority basis. A decision support system (DSS) database for yellow rust has been created at DWR for past 16 years (1995-2010) for Northern Hills Zone (NHZ) and North West Plain Zone(NWPZ). The adult plant response of AVT II material against wheat rust under field conditions is taken under consideration. Fifteen wheat varieties in each zone have been selected to analyze and observe the pathotype trends followed by them. This Database also includes graphical information in terms of trends followed by varieties over the years. The decision makers and researchers can use this database to know the disease resistant wheat varieties in these zones along with their performance over the years. This database will help them in decision making.

Keywords: Decision support system, Knowledge base, Database, DSS Software, Decision Rules, Yellow Rust resistance, Wheat varieties.

INTRODUCTION

Decision support systems are a subset of computer-based information systems. Management support systems consists of DSS, expert systems and executive information systems. Decision making is, in effect, synonymous with management. A DSS can be described as a computer-based interactive human-computer decision-making system that supports decision makers rather than replacing them.

An organizational decision support system is a DSS that is used by individuals or groups at several work stations in more than one organizational units. DSS design is the process of identifying the key decisions through decision analysis, specifying requirements of each DSS component to support key decisions. DSS are designed and implemented to support organizational as well as individual decision making.

Selection Of Disease And Zone

Out of all wheat diseases, yellow rust causes maximum damage to the crop. So while deciding about disease, yellow rust was considered on priority basis.

Two zones NHZ & NWPZ were selected due to pre dominance of disease in these zones. So that Yellow rust resistant varieties in NHZ, NWPZ can be identified.

The sixteen years data from adult plant response of AVT II material against wheat rust under field conditions is taken under consideration.

Fifteen wheat varieties in each zone have been selected to analyze and observe the pathotype trends followed by them over the years.

Objectives

To organize the information available on wheat disease (yellow rust) from co-ordinated trials data into structured databases.

To select the resistant varieties in selected Zones over the years (1995-2010).

To develop the decision support system software for resistant varieties in NHZ & NWPZ.

To test the DSS software developed for selected varieties for information retrieval in desired format.

Esign & Development Procedure

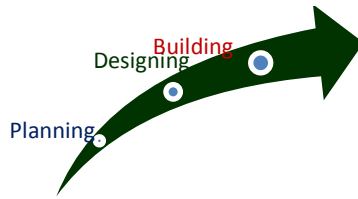


Figure 1. Design & Development Process

DSS development has following four main steps:
 Planning the DSS
 Designing Database & Software (iterative process)
 Building Database & Software modules.
 Maintaining Database & software modules information and structure.

**Technology Developed
 Database Developed**

DSS Database (Ms-Excel) of 16 years for stripe rust resistance(ACI scoring) in NHZ & NWPZ wheat varieties.

DSS Software WHYRV (WHeat Yellow rust Resistant Varieties)Developed :Wheat Crop based DSS developed in asp.net for yellow rust resistant varieties.

SS Database

DSS Database(Ms- Excel) of 16 years (1995-2010) for yellow rust resistance in NHZ & NWPZ Wheat varieties is developed with their ACI scoring.

Wheat (Triticum aestivum) L.				Wheat (Triticum aestivum) L.				Wheat (Triticum aestivum) L.				Wheat (Triticum aestivum) L.			
Year	Zone	Parentage	ACI	Year	Zone	Parentage	ACI	Year	Zone	Parentage	ACI	Year	Zone	Parentage	ACI
1995	NHZ	Wheat	1.5	1996	NHZ	Wheat	1.5	1997	NHZ	Wheat	1.5	1998	NHZ	Wheat	1.5
1999	NHZ	Wheat	1.5	2000	NHZ	Wheat	1.5	2001	NHZ	Wheat	1.5	2002	NHZ	Wheat	1.5
2003	NHZ	Wheat	1.5	2004	NHZ	Wheat	1.5	2005	NHZ	Wheat	1.5	2006	NHZ	Wheat	1.5
2007	NHZ	Wheat	1.5	2008	NHZ	Wheat	1.5	2009	NHZ	Wheat	1.5	2010	NHZ	Wheat	1.5

Figure 2. IRS Database

DSS Softwar

Ewhyrv (Wheat Yellow rust Resistant Varieties):Wheat Crop based DSS developed in ASP.NET (at front end with C# for programming) using Microsoft Visual Studio 2008 for yellow rust resistant varieties .It uses three layers architecture including :-

1. Presentation Layer
2. Application Layer
3. Data Access Layer.

This software provides a facility to select variety and then gives detailed information(ie. Zone ,Variety Name ,Parentage, Year of Release, species, variety Image, 16 year ACI Scoring, rust resistance graph of that variety in following format.

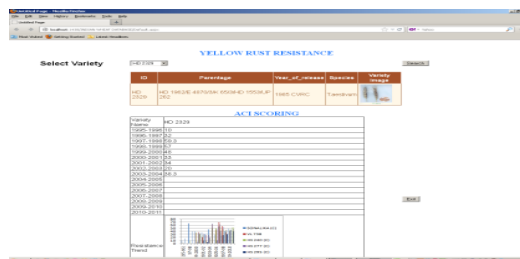


Figure 3. Detailed Information Retrieved

DSS Software

Whyrv (Wheat Yellow Rust Resistant Varieties) Screen 1



Figure 4. IRS Software Screen 1

OutputScreen2

After Information Retrieval

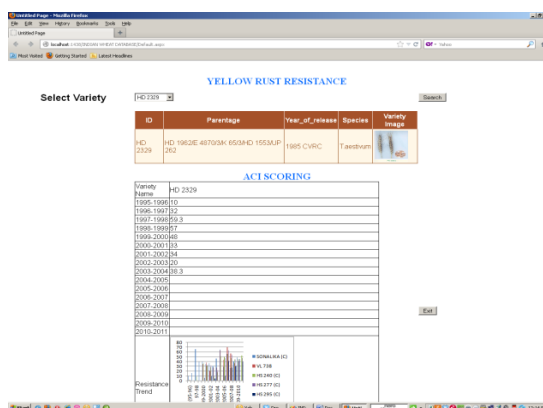


Figure 5. User Interface Output Screen

Outcome Summary

NHZ & NWPZ 16 years data for Yellow Rust Resistance observations show that there are four types of varieties:-

1st group: Varieties which were resistant upto 1995 – 96 to 1997 – 98 but became susceptible after this. This was due to the spread of a new pathotype, 46S119 (Yr9 virulence). These are, HD 2329, HD 2285, HD2687, PBW 175, Sonalika, VL738, HS240, HS277.

2nd group: Varieties that were resistant upto 2005 – 06 but became susceptible from 2006 – 07 with inoculum built up of the new pathotype, 78S84 which was first recorded in March 2001. These are, PBW 343, PBW 373, PBW 502, HS 295, HS 365, HS 420.

3rd group: Varieties that were resistant upto 2009 – 10 but susceptible from 2010 – 11. This was due to the very favourable environment and built up of the inoculums of the pathotype 78S84 and may be some new variant of the earlier pathotypes. These are, DBW 17, PBW 550, VL804 .

4th group: Varieties that remained resistant through out. These are, DBW16, UP2425, VL616, HPW42, WH542, DT46, VL804, WH896, VL832, VL 829, VL892.

Practical Utility

A DSS Database for yellow rust resistance in wheat varieties(16 years) has been created for future reference purposes.

Rust resistance graphs over the years prepared for selected varieties in NHZ & NWPZ can be used to observe resistance trends of varieties.

A DSS software developed is used to retrieve information of resistant varieties in desired format.

The decision makers/researchers can use this software to know the disease resistant wheat varieties in these zones, which will help them in decision taking.

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