AN INTEGRATED RULE-BASED AND CASE-BASED EXPERT SYSTEM FOR HERBICIDE INJURY DIAGNOSIS. Jingkai Zhou, Janet Davidson-Harrington, and Calvin G. Messersmith, Research Specialist, Research Specialist, and Professor, Department of Plant Sciences, North Dakota State University, Fargo, ND 58105.

Herbicides, when selected and used properly, seldom cause unacceptable crop injury, but injury can occur under some conditions. Unacceptable injury most often results from herbicide carryover, drift, misapplication, or equipment contamination. The environment and crop genetics also can have a large influence on the severity of crop injury. Diagnosis of herbicide injury is often difficult, particularly for a non-expert, because of the large number of factors involved. Computer-based expert systems have great potential for solving this problem.

Expert systems use an artificial intelligent reasoning method to solve complex problems within a specialized domain that ordinarily requires human expertise. Rule-based systems (RBS) and case-based systems (CBS) are probably the best-known and most widely used expert systems. They use different formats representing knowledge and different approaches to search for patterns in the knowledge base. The basic unit and format of knowledge in RBS is the rule and in CBS is the case. A rule is represented by the IF-THEN form, where the IF part is called the condition and the THEN part is called the action. A RBS is built on the idea that if the information supplied by the user satisfies the conditions in a rule, then the actions of the rule are executed. CBS attempt to solve a new problem by making an analogy to an old one and adapting its solution to the current situation. RBS and CBS have their strengths and limitations. The goal of integrating the two systems is to augment the positive aspects of the two approaches and simultaneously minimize their negative aspects.

HIDES (Herbicide Injury Diagnosis Expert System) is a Windows-based integrated rule- and case-based system. The general architecture of HIDES consists of user interfaces, a knowledge base, a rule-based subsystem, and a case-based subsystem. The knowledge base consists of basic information about common herbicides and injury diagnostic knowledge represented via rules or cases. The rule-based subsystem is used to determine the suspect herbicides and possible source of the suspect herbicides. The case-based subsystem is used to determine the reason or cause of injury.