

This Week's Citation Classic

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Fehr W R, Caviness C E, Burmood D T & Pennington J S. Stage of development descriptions for soybeans, *Glycine max* (L.) Merrill. *Crop Sci.* 11:929-31, 1971. [Dept. Agronomy, Iowa State Univ., IA; Plant Sci. Res. Div., Agricultural Res. Serv., US Dept. Agriculture, IA; and Dept. Agronomy, Univ. Arkansas, AR]

Development of a soybean plant was divided into vegetative and reproductive stages. The descriptions for the stages apply to all soybean genotypes grown in any environment, can be used for single plants or a community of plants, and are precise and objective. [The *SCI*[®] indicates that this paper has been cited over 175 times since 1971.]

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"When a hailstorm strikes soybeans in the US, crop-hail adjusters from insurance companies have the responsibility of determining the amount of yield loss that the crop sustained. One critical step in the adjustment procedure is to determine the stage of development of the crop when the storm occurred because the ability of a plant to recover is a function of its developmental stage. For that reason, the crop-hail insurance industry has been interested in stages of development ever since they started insuring soybeans.

"The staging system used by crop-hail adjusters from the 1940s to the 1960s was developed for soybeans grown in the Midwest. As the insurance of soybeans in the South grew during the 1960s, there was concern because the staging system developed for indeterminate soybeans in the Midwest didn't fit the pattern of development for determinate soybeans in the South. The crop-hail insurance industry decided they needed a different staging system for soybeans in different latitudes of the US. They independently asked C.E. Caviness, a soybean breeder at the University of Arkansas, and myself to develop the staging proce-

dures. Caviness had his graduate student, J.S. Pennington, evaluate the development for determinate soybeans in the South as part of his MSc research. I worked on a system for indeterminate soybeans in the Midwest at Iowa State University with my graduate student, D.T. Burmood.

"Developing different staging systems for various latitudes of the US had several serious drawbacks. After considerable discussion, Caviness and I decided we should develop a stage of development system that would apply to soybeans grown anywhere in the world. One key was to emphasize the similarities in plant development among different soybeans rather than their differences. The second key was provided by my colleague, R.M. Shibles, a crop physiologist, during an afternoon coffee break. I was discussing with him how difficult it was to relate vegetative and reproductive development in different soybeans. He casually replied that perhaps we should consider them separately instead of trying to force them together unnaturally. The system we subsequently developed has separate descriptions for vegetative and reproductive development.

"Although the research was initially done to assist crop-hail adjusters, the value of a uniform system for describing soybean development was rapidly recognized by soybean scientists. Before our system was developed, each researcher used a different procedure for deciding when a treatment should be applied or a measurement taken. It was difficult to relate one person's results to those of another, which limited the usefulness of some research. Our stage of development system has been adopted by soybean scientists throughout the world. With the help of my wife as artist, we subsequently developed an illustrated bulletin¹ of the stage of development system that aids in understanding and utilizing the procedure.

"The greatest satisfaction from the research is knowing that the results are being used to facilitate communication and research coordination among scientists throughout the world. For recent work which utilizes the staging system, see publications by myself and others."^{2,3}

1. Fehr W R & Caviness C E. *Stages of soybean development*. Ames, IA: Agriculture and Home Economics Experiment Station and Cooperative Extension Service, Iowa State University, 1977. Special Report 80. 11 p.
2. Froehlich D M & Fehr W R. Agronomic performance of soybeans with differing levels of iron deficiency chlorosis on calcareous soil. *Crop Sci.* 21:438-41, 1981.
3. Fehr W R, Hruskoci J D, Hinz P N & Frank S J. *Estimating yield of a soybean field before harvest*. Ames, IA: Cooperative Extension Service, Iowa State University, 1981. 5 p.