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REVIEW: Die Züchtung der Sonnenblume (*Helianthus annuus* L.)

SUNFLOWER BREEDING

Author: Prof.Dr. Walter H. Schuster

Paul Parey Scientific Publishers (Berlin and Hamburg), within the edition Advances in Plant Breeding, Supplement 14 to Plant Breeding, have published the book Sunflower Breeding in the German language. The author of the book is Dr. Walter H. Schuster, Professor Emeritus of the Giessen University, Germany.

Prof.Dr. Walter H. Schuster, who taught plant genetics and breeding at the Giessen University for a number of years, was a pioneer of sunflower research and growing in Germany. From 1948 to the retirement several years ago, he dedicated his research efforts to problems of sunflower genetics and breeding. He should also be mentioned for a contribution to the promotion of sunflower production in developing countries, by supervising a number of researchers from developing countries who took their Ph.D. degrees in sunflower genetics and breeding. I take it as a special privilege to write a review for the book of Prof.Dr. Walter H. Schuster from whom, in 1968, I received a six-month training in the field of genetics and breeding of oil crops.

Prof.Dr. Walter H. Schuster's book Sunflower Breeding (*Helianthus annuus* L.) has 188 pages and it is lavishly illustrated with 99 figures and 18 tables. A long experience and contacts with a large number of sunflower researchers from various parts of the world allowed Prof. Schuster to use 571 references in his book.

The book is divided in ten chapters, appended with summaries in German and English, a list of references, and a glossary of terms from sunflower biology, genetics, and breeding.

The first chapter recounts the history of the cultivated sunflower, starting from the earliest contacts with the crop of the Indians from North and Central America until today. A history of sunflower distribution in the world is also given, together with a review of the sunflower acreages and average yields in different countries.

The second chapter deals with the economic importance of sunflower grain. There is a detailed description of the substances contained in sunflower grain and their uses in human diet, methods of industrial processing, the chief produce (oil, proteins, meal, etc.), and economic uses of sunflower leaves, heads, and stems.

The third chapter gives the systematics and cytology of Helianthus genus. Wild sunflowers are classified in sections and series, and there is also a classification of the cultivated sunflower. The cytological part of the chapter reviews the chromosome number in the wild species and the knowledge of the genome structure of Helianthus genus.

The fourth chapter deals with the morphology and variability of the main parts of the sunflower plant. The root system, stem, leaf, flower, and fruit are described in great detail. This chapter is richly illustrated with photographs taken by the author himself and other authors.

This chapter also treats the flowering and pollination, stages of sunflower growth and development, the biology of the floret, the role of pollinating insects and the effect of environmental factors on the process of pollination.

The topic of male sterility is considered in the sixth chapter. It includes a detailed review of chemical methods for induction of artificial male sterility, sources of nuclear male sterility with marker genes, and most important sources of cytoplasmic male sterility and fertility restoration in the F1 generation.

In the seventh chapter, the author discusses selfing and crossing techniques on the basis of his own rich personal experience. An additional value of this chapter is that it presents a method of monitoring breeding materials through generations of selfing and the degree of depression of various characters caused by inbreeding.

The best part of the book is definitely the eight chapter which deals with breeding objectives. It includes an analysis of seed yield forming and a large number of parameters which affect the yield forming directly or indirectly. There is an account of the results achieved in various parts of the world in the field of sunflower breeding for resistance to pathogens. There are detailed descriptions of sources of resistance to various pathogens, modes of inheritance of resistance, and genes conferring resistance, as well as results of sunflower breeding for resistance to Orobanche cumana and some insect pests.

The main part of the chapter is concerned with selection for high oil and protein content in seed and components of quality (compositions of higher fatty acids and amino acids). Sufficient room is dedicated to sunflower selection for green herbage used as cattle feed. For romantic souls, there is a description of sunflower uses as a decorative plant.

Methods of sunflower breeding are described in the ninth chapter. There are a method of development of hybrids based on cytoplasmic male sterility, a method of development of inbred lines, study of general and specific combining ability, and a scheme of conversion of inbred lines into the CMS form and incorporation of restorer genes. The first part of this chapter is concluded with a review of methods of hybrid seed production.

The second part of the ninth chapter deals with methods of breeding. It covers the use of mass selection, Pustovoit's method of reserves for improvement of sunflower varieties, recurrent selection and reciprocal recurrent selection. This chapter describes also the use of wild sunflower species in interspecific hybridization.

An important portion of this chapter is dedicated to the use of biotechnological methods in sunflower breeding: embryo culture, anther and pollen culture for production of haploid plants, somatic hybridization, and possibilities of gene manipulation at the molecular level. At the end of the chapter, there is a review of mutagenic chemicals used to increase the genetic variability of sunflowers.

The tenth chapter gives a concise review of the history of development of sunflower varieties and hybrids in the world.

The book is concluded with short summaries in German and English.

Prof.Dr. Walter H. Schuster's book is an important contribution to the literature on sunflower breeding. On behalf of the international community of sunflower breeders, I am rendering thanks to Prof. Schuster for gathering his extensive experience and knowledge in the book which may be of invaluable help to young researchers. I would also like to suggest to the publisher to have this valuable volume translated into English which would make it more accessible to sunflower breeders.

Novi Sad, October 1993 Prof.Dr. Dragan Škorić