

# **EXPLORATION FOR WILD *HELIANTHUS ANOMALUS* AND *H. DESERTICOLA* IN THE DESERT SOUTHWEST USA**

GERALD J. SEILER<sup>1</sup> and MARY BROTHERS<sup>2</sup>

<sup>1</sup>U.S. Department of Agriculture, Agricultural Research Service,  
Northern Crop Science Laboratory, Fargo, ND 58105

<sup>2</sup>U.S. Department of Agriculture, Agricultural Research Service,  
North Central Regional Plant Introduction Station,  
Ames, IA 50011

## **Introduction**

The genus *Helianthus* is composed of 50 species and 19 subspecies with 13 annual and 37 perennial species. The narrow genetic base of cultivated sunflower has been broadened by the infusion of genes from the wild species, which have provided a continued source of desirable agronomic traits. There has been an increased interest in breeding sunflower for drought tolerance. *Helianthus anomalus* and *H. deserticola* are excellent candidates for drought tolerance genes, based on their adaptation to desert environments. Unfortunately, due to the demand for the seed of these species and the difficulties of regenerating the original populations, seed has not been available for research for almost 20 years. The objective of the present study was to undertake an exploration to the desert southwest US to collect seeds of the two desert species to make them available for further research.

## **Materials and Methods**

The sunflower exploration took place from September 16 to September 23, 2000. The exploration covered 2550 miles in three states, Utah, Arizona, and Nevada. Heads were collected from 10 to 100 plants within each population and bulked into a single sample. Herbarium specimens were deposited in the USDA-ARS wild *Helianthus* herbarium at Fargo, ND. The seed samples were deposited at the USDA-ARS North Central Regional Plant Introduction Station, Ames, IA where they are maintained and distributed.

All populations were collected from the distributional range of the species. Prior locations and generalized distribution maps were used to locate populations. Population size (number and extent), habitat, soil type, seed set per head, and the presence of diseases, insects, and other wild sunflower species were recorded for each population. Oil content and fatty acid composition were determined on collected populations.

## Results and Discussion

Two species, *H. deserticola* (Figure 1a, b) and *H. anomalus* (Figure 2a, b), were collected during the exploration.

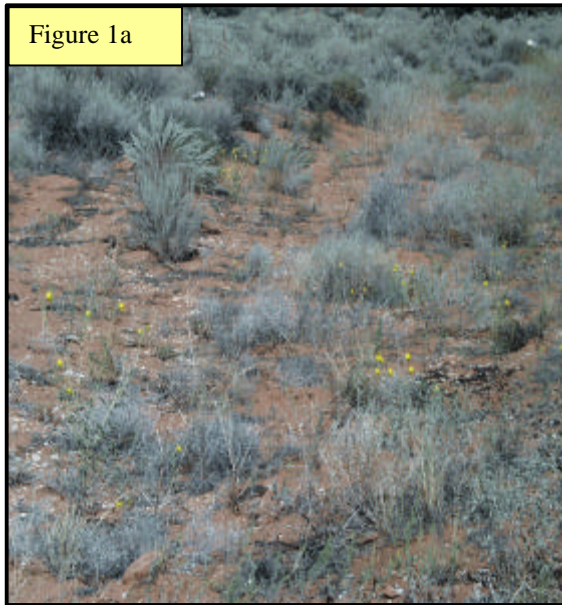


Figure 1a

*H. deserticola*, Washington Co., Utah. Note brown sandy soil and the associated sagebrush vegetation.

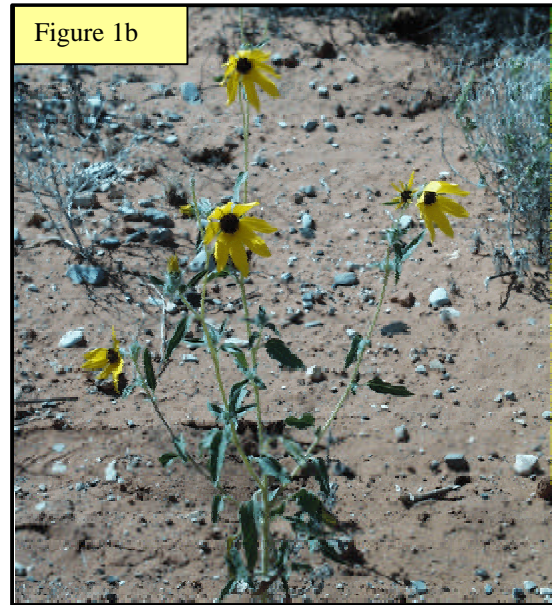


Figure 1b

*H. deserticola*, Washington Co., Utah. Typical plant with branching below and terminal heads.



Figure 2a

*H. anomalus*, Jaub Co., Utah. Note white shifting sand dunes and cedars in the background.



Figure 2b

*H. anomalus*, Jaub Co., Utah. Typical plant with whitish stem and multiple heads with large bracts.

It had been 20 years since 25 known locations of the two species were last visited. For unexplained reasons, only three populations had plants with seeds for collection in 2000 (Table 1). It had been extremely dry in most of the areas explored, with no evidence of the species being present in the fragile sandy habitats.

<b>Table 1.</b> Species, location, habitat, and size of population collected during the exploration.				
<b>Species</b>	<b>Identification Number</b>	<b>Location</b>	<b>Habitat</b>	<b>Population Size</b>
<i>H. deserticola</i>	AMES-26094 DES-2345	Washington Co., Utah, Anderson Junction	Sandy desert sagebrush	250
<i>H. anomalus</i>	AMES-26095 ANO-2346	Jaub Co., Utah, Little Sahara Recreation Area, White Sands Campsite	Shifting white sand dunes	200
<i>H. anomalus</i>	AMES-26096 ANO-2347	Jaub Co., Utah, Little Sahara Recreation Area, Jericho Picnic Area	Upper slope of shifting white sand dune	250

The three populations were analyzed for oil content and fatty acid composition (Table 2.)

<b>Table 2.</b> Oil content and fatty acid composition of species populations collected during the exploration.					
<b>Species</b>	<b>Oil Content</b>	<b>Fatty Acids</b>			
		<b>%</b>			
		<b>Palmitic</b>	<b>Stearic</b>	<b>Oleic</b>	<b>Linoleic</b>
<i>H. deserticola</i> (DES-2345)	33	6.5	3.5	32.0	54.2
<i>H. anomalus</i> (ANO-2346)	43	5.8	2.3	20.1	69.3
<i>H. anomalus</i> (ANO-2347)	46	6.4	2.3	21.2	68.6

The *H. deserticola* population had a typical oil content of 33%, while the populations of *H. anomalus* had a very high oil content, the highest ever observed in any wild species. The fatty acid profiles of *H. anomalus* had a high linoleic acid concentration for a desert environment, approaching 70%. A linoleic acid concentration of 54% in *H. deserticola* is

more typical of the expected concentration in a desert environment. The saturated palmitic and stearic fatty acids in *H. anomalus* averaged 8.4%, about 25% less than in cultivated sunflower oil.

*Helianthus anomalus* has the largest seed and the highest oil concentration of any of the wild sunflower species. This will facilitate breeding when the wild germplasm is transferred into cultivated sunflower for further screening of drought tolerant traits.

### **Acknowledgments**

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