

# Phenotypic Documentation of *Gossypium* Species from the U.S. Cotton Germplasm Collection Using Digital Photography

Monica Sheehan, Jane K. Dever, and Mark D. Arnold



Texas AgriLife Research and Extension Center at Lubbock  
1102 E. FM 1294, Lubbock, Texas USA

## Introduction

The diversity of morphological traits in wild cotton germplasm collections has proven to be a resource for cotton breeders to introduce genetic diversity into a breeding program. The importance of finding new sources of genetic variability to combat biotic and abiotic stresses has become a leading goal for many cotton breeding projects. Having useful characteristics of the wild cotton documented and photographed will allow for breeders to have visual access via a computerized data system. Phenotypic characteristics of various *Gossypium* species were documented from greenhouse grown plants using digital photography. A scoring system, along with digital images of traits ranging from qualitative descriptors to color, shape, and pubescence of the plants botanical features were recorded (Figs. 1&2). These traits can then be viewed for a more accurate account of the description.

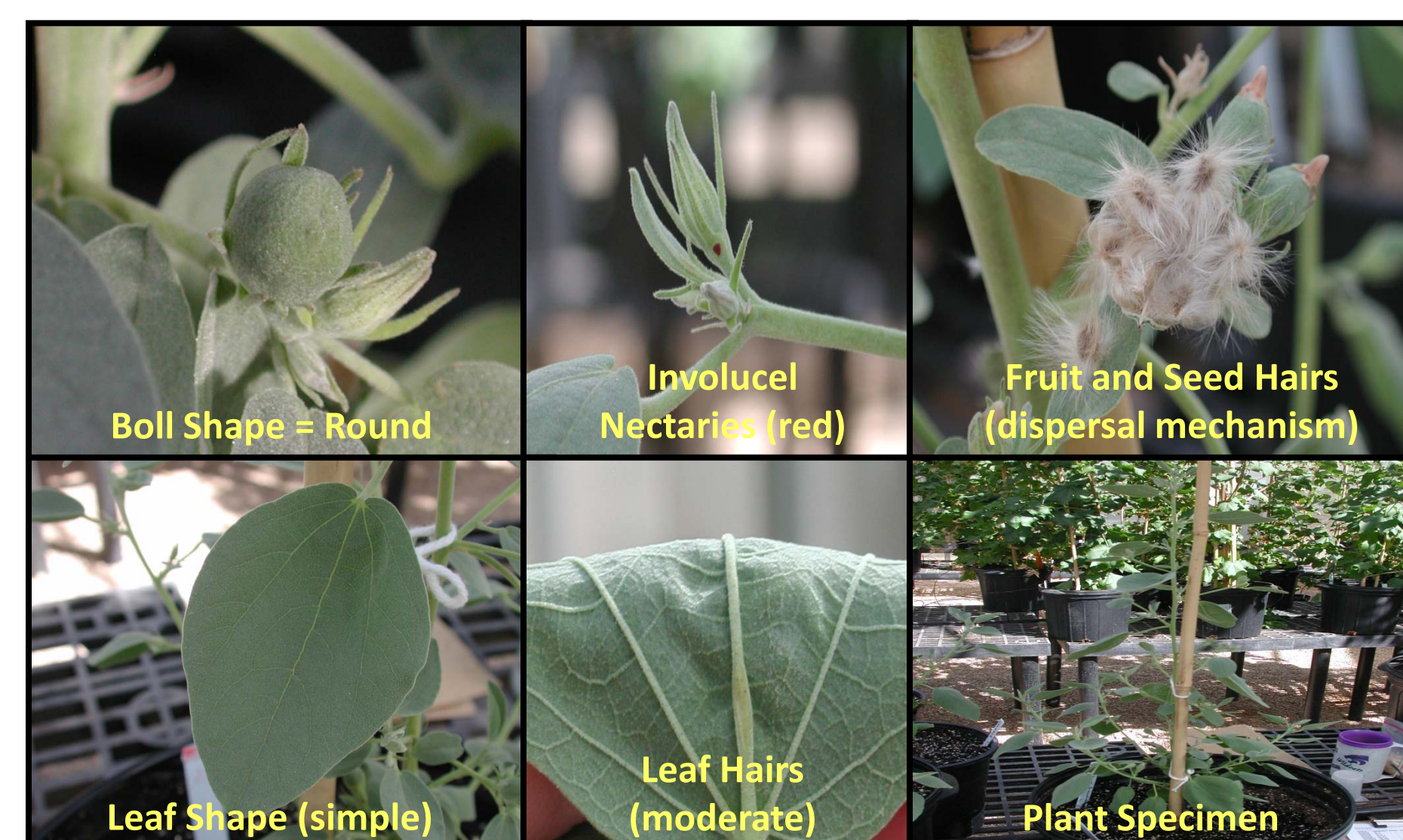


Figure 1. *Gossypium australe* F. Muell. MALVACEAE (C3-1)

## Objectives

The goal of this project is to have this information accessible to help with cotton screening projects and to share with the public. The USDA Germplasm Resource Information Network (GRIN) has a wealth of information, but not many images of species specific characteristics. Incorporating digital colored images of these *Gossypium* species into a database will help provide references for future phenotypic evaluations.

1. Document phenotypic traits of *Gossypium* species using a scoring system along with digital images depicting descriptions of common cotton characteristics.
2. Incorporate photographs into a database for future references on morphological traits of wild cotton.

## Methods

Cotton accession seed obtained from the US Cotton Germplasm Collection at College Station, TX are planted annually in the greenhouse for seed increase to be used for testing in various screening projects. Three to five plants of each accession is evaluated throughout its growing cycle. Characteristics selected for digital imaging was based on previous descriptive data recorded using the GRIN guidelines and published taxonomic documents (Fryxell 1979, Pervial 1987). A digital photograph is taken to enhance and document each specific characteristic being described (Table 1).



Figure 2. Variability of seed coat linters among *Gossypium* species.

Table 1. Descriptors of morphological traits and scoring methods for cotton accessions from the USDA-ARS Cotton Collection at College Station, TX.

Category	Traits	Scoring Scale
<b>Vegetative</b>		
Bract	Shape	1= normal, 2= frego, 3= segregated
Glands	Gossypol	1= glanded, 2= glandless
Leaf	Color	1= green, 2= red, 3= virescent yellow 4= dark red, 5= segregating
Leaf	Hairs	1= no leaf hairs, 2= few hairs, 3= moderate 4= hairy, 5= very hairy, 6= pilose
Nectaries		1=nectaried, 2=nectariless, 3= segregated
<b>Inflorescence</b>		
Petal	Color	1= yellow, 2= cream, 3= cream/red 4= segregating, 5=dark yellow, 6= light yellow 7= red, 8= lavender
Petal	Spot	0= absent, 1=light spot, 2= medium, 3= heavy
Pollen	Color	1= yellow, 2= cream, 3= segregating 4= dark yellow, 5= red
<b>Fruit</b>		
Boll	Shape	1= round, 2= ovate, 3= conical
Lint	Color	1= no lint, 1= white, 2= cream, 3= light brown 4= brown
Seed Coat	Fuzz Fibers	0= naked, 1 sparse, 2= fuzzy, 3= segregating

## Summary

Since the inception of the Crops Genetic Research Facility located on the Texas AgriLife Research and Extension Center at Lubbock over five hundred cotton accessions have been increased and phenotypically documented using digital photography. Germplasm accessions evaluated in Table 2 proved to exhibit a range of variability among the *Gossypium* species grown. Several accessions from the following species; *G. mustelinum*, *G. darwinii*, *G. aridum*, *G. raimondii* were photoperiodic during our growing season. An example of the detailed images documented for this study are shown in (Fig. 3. a, b, & c). Preserving images through a database will allow fellow scientists to access visible traits that can be interpreted for their own use in studies.

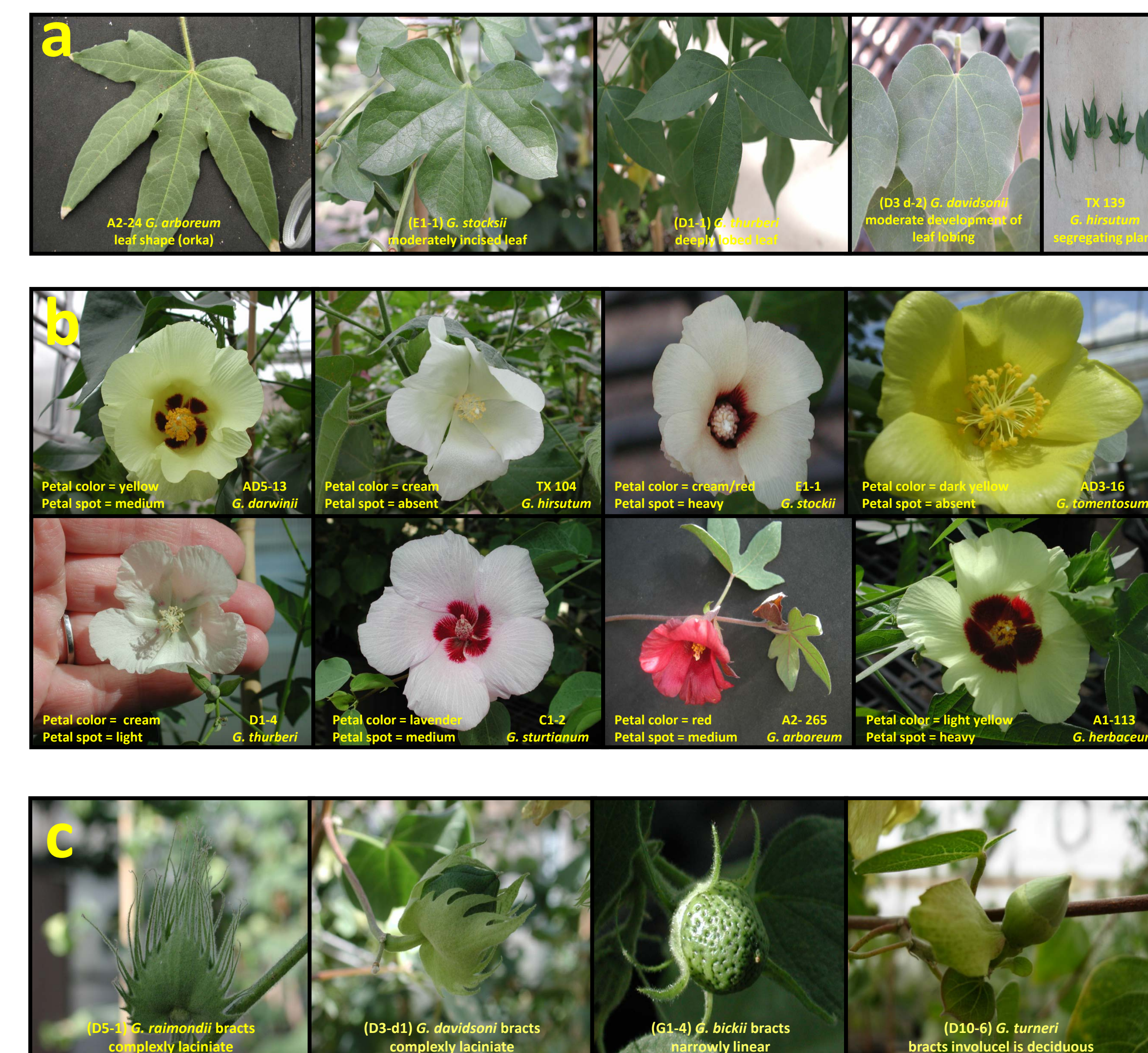


Figure 3. Leaf shape (a), petal color and petal spot (b) and bract (c) descriptors.

Table 2. List of *Gossypium* species evaluated and photographed.

Genome group	# of accession evaluated	Species	Distribution
A1	5	<i>G. herbaceum</i>	Old World Cultigen
A2	7	<i>G. arboreum</i>	Old World Cultigen
(AD)3	1	<i>G. tomentosum</i>	Hawaii, United States
(AD)4	6	<i>G. mustelinum</i>	Brazil
(AD)5	9	<i>G. darwinii</i>	Galapagos Islands
B1	2	<i>G. anomalum</i>	Africa
B2	1	<i>G. triphyllum</i>	Africa
C1	4	<i>G. sturtianum</i>	Australia
C1-n-1	1	<i>G. nandawarensis</i>	Australia
C3	2	<i>G. australe</i>	Australia
C9	2	<i>G. nelsonii</i>	Australia
D1	3	<i>G. thurberi</i>	Mexico, U.S. (Arizona)
D2-2	1	<i>G. harknessii</i>	Mexico
D3-d	3	<i>G. davidsonii</i>	Mexico
D3-k	2	<i>G. klotzschianum</i>	Galapagos Islands
D4	1	<i>G. aridum</i>	Mexico
D5	3	<i>G. raimondii</i>	Peru
D10	2	<i>G. turneri</i>	Mexico
E1	2	<i>G. stocksii</i>	Arabia
E2	1	<i>G. somalense</i>	Arabia
E3	1	<i>G. areysianum</i>	Arabia
F1	3	<i>G. longicalyx</i>	Africa
G1	1	<i>G. bickii</i>	Australia
Arizona B Collection (GB)	5	<i>G. barbadense</i>	Bulgaria
Day-Neutral Cotton Primitive Germplasm (GP)	21	<i>G. hirsutum</i>	U.S. (Mississippi)
Mississippi Obsolete Variety Collection (SA)	16	<i>G. hirsutum</i>	Bulgaria
TX Collection (Current & obsolete cultivars, breeding stocks, primitive & wild accessions)	500 +	<i>G. hirsutum</i>	New World Cultigen

## Follow-up Research

We hope to continue in our efforts to obtain seed accessions from the US Cotton Germplasm Collection. As evaluation of the collection is developed, data and images will be incorporated into the GRIN database. Technical support and direction to properly incorporate this material will commence in the near future.

## References

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Pervial, A. E. 1987. The national collection of *Gossypium germplasm*. USDA Southern Crops Ser. Bull. 321  
Dept. of Agric. Commun., College Station, TX.

This poster reports results of research conducted at the Crops Genetic Research Facility located on the Texas AgriLife Research and Extension Center at Lubbock. Contact Monica Sheehan at M-bellow@tamu.edu.

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