



# Usefulness of Descriptors in Phenotyping Germplasm Collections

**Gary A. Pederson and Merrelyn Spinks**  
 USDA, ARS, Plant Genetic Resources Conservation Unit, Griffin, GA

## Introduction

A large number of crop germplasm collections are maintained within the U.S. National Plant Germplasm System (NPGS). For each of these crop collections, Crop Germplasm committees (CGC), crop curators, and collection staff have established extensive lists of descriptors or phenotypic traits by which to evaluate and differentiate accessions. Descriptor data is maintained on the Germplasm Resources Information Network (GRIN-Global) and utilized by requestors to select accessions that would best meet their research needs. This presentation will evaluate the descriptors for five representative crops maintained at the Plant Genetic Resources Conservation Unit (PGRUCU), Griffin, GA, to determine the usefulness of descriptors in properly evaluating accessions within each crop germplasm collection.

## Number of Accessions with Descriptor Data

Crop	Number of Accessions and % of Collection with Descriptor Data			
	No data	0-1 Descriptors	0-5 Descriptors	0-10 Descriptors
Annual clover	214 (9%)	1,090 (49%)	1,272 (57%)	1,574 (70%)
Chili pepper	518 (10%)	1,185 (24%)	1,382 (28%)	1,546 (31%)
Sorghum	930 (3%)	2,587 (7%)	7,850 (21%)	10,971 (30%)
Sweetpotato	274 (36%)	275 (36%)	293 (38%)	312 (41%)
Watermelon	283 (15%)	295 (15%)	544 (29%)	834 (44%)

## Crops and Descriptors

Crop	Number of accessions	Number of descriptors	Descriptors in replicated environments
Annual clover	2,245	51	13
Chili pepper	4,934	71	6
Sorghum	36,635	80	9
Sweetpotato	767	115	9
Watermelon	1,908	44	7

## Number of Distributions/Accession from Accessions with Limited Descriptor Data

Crop	Number of Distributions/Accession and % of Total Distributions				
	No Descriptor Data	0-1 Descriptors	0-5 Descriptors	0-10 Descriptors	Crop Average Distribution
Annual clover	<1 (<1%)	2.4 (25%)	2.9 (35%)	4.1 (62%)	4.7
Chili pepper	7.1 (4%)	7.9 (10%)	8.3 (13%)	8.6 (15%)	18.0
Sorghum	4.6 (2%)	3.3 (3%)	4.4 (13%)	6.1 (25%)	7.3
Sweetpotato	6.6 (23%)	6.7 (23%)	7.0 (26%)	7.0 (28%)	10.2
Watermelon	9.5 (6%)	9.8 (6%)	15.5 (18%)	19.0 (35%)	23.9

## Top Five Descriptors Evaluated

Annual clover	Chili pepper	Sorghum	Sweetpotato	Watermelon
Seed weight	Mature fruit color	Seed weight	Storage root shape	Bacterial fruit blotch
Plant height	Fruit position	Plant height	Dry matter	Fruit shape
Flower color	Fruit shape	Flowering rating	Root size variability	Fruit color pattern
Leafiness	Fruit width	Mid-rib color	Chemical conc. (baked)	Background color
Vigor	Fruit length	Stalk juiciness	Chemical conc. (raw)	Gummy stem blight

## Results

1. Number of descriptors varies greatly among crops.
2. 30-70% of accessions within crop collections have limited descriptor data (<= 10 descriptors).
3. Accessions with limited descriptor data are not as extensively utilized by researchers as well-described accessions, though this varies by crop.
4. Growth, production, and morphological descriptors are often not taken under replication and are likely confounded by year & location.

## Conclusions

1. Descriptor data presently in GRIN-Global is limited in its usefulness for phenotyping accessions.
2. Replicated trials conducted in multiple years and/or locations are needed to better evaluate accessions within plant genetic resource collections.