

The Guar Breeding Project at Texas Tech University
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August 14, 2017
USDA-NIFA-SCRI Guar Planning Proposal Conference

The overall objective of the guar breeding program at Texas Tech was to breed new varieties with desirable characters related to seed yield and gum quality. Gum content and branching habit were investigated as the targets for genetic improvement of seed yield and high gum content.

The program began in 1998 with screening of 404 Plant Introductions from Griffin, GA. Accessions were direct seeded into 10-foot plots and data collected from each growout (below). Gum content in the highly variable accessions ranged from 33.9 to 41.2%. Each accession was evaluated for morphology and overall field performance. Selections of elite lines based upon gum content and field performance were selected from among these accessions as candidates to move forward.

Gum Content

fg% - gum content - ability to add viscosity to water at a set temperature

M/G ratio – mannose:galactose ratio.

Gum – a galactomannan polysaccharide extracted from guar seed endosperm

Morphological and phenotypic markers used in selection processes:

- branching type – erect, basal branching, branching.
- # of branches
- plant height
- stem morphology
- lodging
- leaf hair – pubescent (hairy), glabrous (no hair).
- leaf size – small or large. Small dominant, large recessive
- fruiting – every node, skip two and set two pods, skip a node
- # seeds per pod
- pod length
- maturity
- fg%

Two high gum, elite lines with different branching habits were selected and eventually released as Matador (branching) and Monument (erect). Both have Plant Variety Protection Act status (e.g., these are protected varieties; for information on obtaining a research sample of either line, contact Dr. Eric Hequet, PSS chairman, eric.hequet@ttu.edu, or 806-834-0621).

Inheritance Studies

Heritability of branching, leaf surface and gum content were studied with hand-pollinated reciprocal crosses of an erect, pubescent, high gum line (39.04%), PI 217923 with basal branching, glabrous, low gum line (37.41%), 'Lewis'.

Gum content was increased providing evidence that gum content is controlled by at least one pair of genes and increases in gum content can be achieved through selective breeding.

Branching. F2 population segregated 3:1, branching:erect, simply inherited single gene locus designated as Brh-1. Erect dominant, branching recessive.

Leaf surface. Pubescent, glabrous. Pubescent dominant, glabrous recessive.

Cyamopsis Species

Genetic relationship among *Cyamopsis* species was investigated using morphological, isozyme and RAPD markers of four commercial varieties and two plant introductions (PIs) of *C. tetragonoloba*, one *C. senegalensis*, and one *C. serrata*.

Cage crossing vs. hand pollination studies

Using morphological markers and heritability in earlier studies, a high fg% diallele crossing block was done to investigate transgressive segregation in F3 populations.

Cage-crosses and hand-pollinated crosses were used. Hand pollinated set 40,000 pods, with 200 putative hybrid pods. Cage crosses yielded more hybrids - of 48,000 pods set, 458 were putative hybrids.

Collaborators:

Anfu Hou, Post-Doc

Weixin Liu, PhD

James Hodges, technician

Stacy Gill, MS

Dick Auld, (retired) faculty PSS

10 refereed publications, 2 PVP's for Matador and Monument

Ancillary studies

Association of seed coat color with seed water uptake, germination, and other seed characteristics

Black seeds greater water uptake than lighter colored seeds.

Black seeds higher germination than lighter colored seeds.

Black seeds had lower seed coat quantity than lighter colored seeds.

Black seed endosperm not significantly different from lighter colored seeds.

Salinity studies

42 accessions were evaluated for salt tolerance. Seed germination ranged from 7% to 90%.

Accessions with highest germination were selected for growouts in a salt nursery. Significant differences were observed for seed yield per pod but not for seed yield, plant height, branch number or pod number suggesting some potential for selecting for increased salt tolerance.