

Practical Training for On-farm and Collaborative Plant Breeding Webinar Series 2: Selecting High-quality Breeding Material

Julie Dawson, UW Madison, Paulina Jenney, UW Madison, Emily Rose Haga, Keith Mueller, KC Tomato, Michael Lordon, Organic Seed Alliance

- Welcome to the webinar! We'll be starting right at the top of the hour!
- This webinar is being recorded and will be available on the eOrganic YouTube channel within a week.
- If you have a question, type it into the Q and A box—we'll be reading the questions aloud after the presentation is over.

Upper Midwest Collaborative Plant Breeding Network



Webinar Series

1. **Goal setting and design (Jan 10)**
Identifying opportunities and designing projects
1. **Selecting high-quality breeding material (Jan 17)**
Choosing parents, Accessing germplasm, MTA's, IPR
1. **Management considerations for seed quality (Jan 24)**
Seedborne diseases, Seed testing and sanitation
1. **Getting to variety release (Jan 31st)**
Commercialization planning, Licensing, IPR
1. **Scaling up seed production (Feb 7th)**
Enterprise budgets, Stock seed, Contracting
1. **Data management and analysis (Feb 14th)**
Managing pedigrees and data, answers to your analysis questions!



Why do you need a new variety?



Deciding on the best parents

- Have a clear goal and variety that you would like to 'beat' for each trait
- Understand whether your trait is likely to be controlled by a few genes (color, shape, some disease resistances), or by many genes (yield, flavor, stress tolerance)
- Try to find out what the expectations are for that trait in a cross from other breeders



F4 Juliet x Blush
(Erica Kemper)

Photo Shelley Jansky. F2
population of DM1-3 x MB.

Deciding on the best parents

- Look at existing varieties – do any of them have the characteristics you want for each trait?
- If not, do germplasm resources? How far from commercially viable are they?
- Talk to other breeders - is anyone else working on this and what have they observed



Hazelnut
genetic
resources,
USDA NPGS,
Corvallis, OR

Introduction to NPGS - GRIN and Intellectual Property Rights (IPR)

Paulina Jenney, Research Coordinator, UW - Madison





What is GRIN?

www.ars-grin.gov

The Germplasm Resources Information Network (GRIN) web server provides germplasm information about plants, animals, microbes and invertebrates important for food and agricultural production. These include lists of currently registered cultivars, historical seed and varietal catalogs, and related resources.

There are more than 600,000 accessions (distinct varieties of plants) in the GRIN database. These accessions represent more than 10,000 species of



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Simple Search List Search **Advanced Search** **Results**

If your results aren't what you expected, try using the Advanced Search tab and filling in more information. Your query included:

☐ View Observation Data

Selected item(s) below: [Add to Cart](#) [Add to Wish List](#) [View Accession Details](#)

Basic Info	Source Info	Show all columns	Showable columns	Show 10 rows	Reset	Search
Showing 1 to 10 of 500 entries						
<input type="checkbox"/> * ACCESSION	NAME	TAXONOMY	ORIGIN	REPOSITORY	IMAGE	AVAILABILITY
<input type="checkbox"/> P 607593	PESTIE-44 GREEN	Vigna unguiculata (L.) Walp.	United States	US		
<input type="checkbox"/> P 607604	Charleston Greenpod	Vigna unguiculata (L.) Walp.	United States	US		
<input type="checkbox"/> P 606576	QUICKPOCK PRINCEY	Vigna unguiculata (L.) Walp. Vigna unguiculata unguiculata Group	Louisiana, United States	US		
<input type="checkbox"/> P 604476	YUMCKE ZULU	Vigna unguiculata (L.) Walp.	United States	US		
<input type="checkbox"/> P 604761	YAKOLABA KULAP	Vigna unguiculata (L.) Walp.	United States	US		

(Results of more than 500 will not return images.)

Simple Search List Search **Advanced Search** **Results**

The more information you provide, the better the search will be.

Scientific name (any part)

Plant name

Repository

Country of Origin

Other search criteria:

Search for:

Simple Search List Search **Advanced Search** **Results**

If your results aren't what you expected, try using the Advanced Search tab and filling in more information. Your query included:

☐ View Observation Data

Selected item(s) below: [Add to Cart](#) [Add to Wish List](#) [View Accession Details](#)

Basic Info	Source Info	Show all columns	Showable columns	Show 10 rows	Reset	Search
Showing 1 to 1 of 1 entries						
<input type="checkbox"/> * ACCESSION	NAME	TAXONOMY	ORIGIN	REPOSITORY	IMAGE	AVAILABILITY
<input type="checkbox"/> P 67640	2296	Vigna unguiculata (L.) Walp. Vigna unguiculata unguiculata Group	Arizona, United States	US		

NPDS germplasm is not available for individual, home, or community gardening, or for

Details for: PI 321640, *Vigna unguiculata* (L.) Walp. subsp. *unguiculata* Unguiculata Group, 22316

Summary **Passport** Taxonomy Other Pedigree PIS Observation

Summary Data

Taxonomy: *Vigna unguiculata* (L.) Walp. subsp. *unguiculata* Unguiculata Group

Top Name: 22316

Origin: Collected - Arizona, United States

Maintained: Plant Genetic Resources Conservation Unit, Gortals, GA

Received by NPGS: 15 Aug 1967

PI Assigned: 1967

Improvement: Cultivated material

Status: Seed

Form Received: National Laboratory for Genetic Resources Preservation

Backup Location: 175

Inventory Volume: View original Plant Inventory data in pdf format

Availability

Form	Quantity	Note	Inventory	Cart
Seed	25 count		PI 321640 01 60	

Showing 1 to 1 of 1 entries

[Add to Wish List](#)

Restrictions

Plant material may be subject to additional regulations

https://www.nationalgeneticresources.org/news/5046/31967/1236/dshqumsummy2022-final_42/2022.pdf

- USA - Idaho (as *Vigna unguiculata* subsp. *sepioides*) See state regulations (Plant Commodity Summaries.)

There are no images for this accession.

Details for: PI 321640, *Vigna unguiculata* (L.) Walp. subsp. *unguiculata* Unguiculata Group, 22316

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Accession Names and Identifiers

22316 Type: Collector identifier NBSL 376812 Type: Inventory

HSG 1066 Type: Exploration identifier

Group: PED-EXPLORATIONS

Exploration ID link

Source History

Collected

1966, Arizona, United States

Locality: Papago Indian Reservation, Chukar Kik District, Newfields, Arizona.

Collector(s):

- Gentry, Howard Scott, Crops Research Division - USDA-JARS

Narrative

White with black eye.

USDA ARS-GRIN

Collections > Crop Germplasm Committees > National Genetic Resources Advisory Council > GRIN-U > Contact Us



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There are more than 800,000 accessions (distinct varieties of plants) in the GRIN database. These accessions represent more than 10,000 species of

Details for: PI 642161, *Vigna unguiculata* (L.) Walp. subsp. *unguiculata* Unguiculata Group, IT87K-819-118

Summary

Passport

Taxonomy

Other

Pedigree

IPR

Observation

Core Passport Data

Taxonomy:
Vigna unguiculata (L.) Walp. subsp.
unguiculata Unguiculata Group
Top Name:
IT87K-819-118
Origin:
Developed – Nigeria
Maintained:
Plant Genetic Resources Conservation Unit,
Giffels, GA
Received by NPGS:
11 Jan 2008
Improvement:
Breeding material
Status:
Reproductive
Uniformity:
Pureline
Form Received:
Seed

Accession Names and Identifiers

IT87K-819-118
Type: Developer Identifier
NSSL 440433
Type: Inventory

Narrative

It has semi-spreading growth habit with medium maturing (about 80 days), drought and heat tolerance and specially adapted to the drier region. It has medium size brown color seeds (14 g/100 seeds) with rough seed coat. Because of its consistently good performance in the Sahel and its resistance to Striga, it has been found promising for cultivation in Niger Republic.

Source History

Developed:
PHE 11 January 2008, Nigeria
Developer(s):
• Adesile, R.A., Ahmad Bello University
• Ajelagbe, H.A., International Institute of Tropical Agriculture

PUBLIC RELEASE

Details for: PI 642161, *Vigna unguiculata* (L.) Walp. subsp. *unguiculata* Unguiculata Group, IT87K-819-118

Summary

Passport

Taxonomy

Other

Pedigree

IPR

Observation

Intellectual Property Rights

Crop Science Registration, GP-258, OTHER LEGUMES, Issued: 01 Sep 2006.
• Singh, R., O. O. Olufajo, M. F. Isiyaku, R. A. Adesile, H. A. Ajelagbe, & S. G. Mohammed. 2006. 6 improved germplasm lines of cowpea. Crop Sci. (Madison) 46(5):2332.

"Small quantities of seed can be provided for research purposes on request. The authors do not wish to file for patent or intellectual property rights for these germplasm lines. However, the users of these lines are asked to make appropriate acknowledgment of the source."

• Check publication

• Generally OK for research and breeding

PLANT VARIETY PROTECTION

Details for: PI 606785, *Vigna unguiculata* (L.) Walp., "PETITE-N-GREEN"

Summary

Passport

Taxonomy

Other

Pedigree

IPR

Observation

Intellectual Property Rights

U.S. Plant Variety Protection
PVP 9960074
Variety: Petite-N-Green
Taxonomy: *Vigna unguiculata* (L.) Walp.
Experimental name/synonym: US-881
Crop: COWPEA
Applicant: The United States Government as represented by the Secretary of Agriculture
Date filed: 11/13/1998
Date issued: 02/08/2001
Status: Certificate Expired
Status date: 02/08/2001

• Not available from GRIN until after certificate expires

• May be available commercially

• OK for research and breeding

• Not OK to commercialize F1 offspring

UTILITY PATENT

Details for: PI 663866, *Solanum tuberosum* L., 'FL 2086'

Summary	Passport	Taxonomy	Other	Pedigree	IPR	Observation
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Intellectual Property Rights

U.S. Utility patent. Issued: 09 Dec 2008. (Filed: 3/1/2007 permits owner to exclude others from making, using, or selling the invention for a period of up to twenty years from the date of patent application filing.) **Utility Patent 7462761**

U.S. Plant Variety Protection
PVP 200700087
Variety: FL 2086
Taxonomy: *Solanum tuberosum* L.
Experimental name/synonym: 1998 309.11
Crop: POTATO
Applicant: Frito-Lay North America, Inc.
Date filed: 01/11/2007
Date issued: 10/28/2011
Status: Certificate Issued
Status date: 10/28/2011

- Not available from GRIN until after patent expires
- Not OK for research and breeding until after patent expires



Intellectual Property Rights (IPR) on Seed

Type of IP	Plant Patent	Plant Variety Protection Act	Utility Patent	Trademark	Trade Secret	Copyright	Open Source Software License
Is legally binding?	Yes. Plant Patent Act, 1930	Yes. Plant Variety Protection Act, 1997	Yes. Patent Act 1970	Yes. Registered Trademark Act, 1999	Yes. Not legally binding but can be enforced by contract	Yes. Copyright Act, 1912	Yes. A license is binding on the licensee
What are common examples of IP?	Plant patents grant exclusive rights to the inventor of a new plant variety. They are often used for ornamental plants and crops that are propagated by cuttings or grafting.	Plant Variety Protection (PVP) grants exclusive rights to the breeder of a new plant variety. It is similar to a patent but covers only the breeding and propagation of the variety.	Utility patents cover inventions that are new, useful, and non-obvious. They can cover a wide range of inventions, from mechanical devices to chemical compounds.	A trademark is a symbol, word, or phrase that identifies the goods or services of a particular company. It is used to distinguish the company's products from those of its competitors.	Trade secrets are confidential business information that provides a competitive edge to the owner. Examples include formulas, processes, and customer lists.	Copyrights are automatic rights that protect original works of authorship, such as books, music, and software. They give the creator the exclusive right to reproduce and distribute the work.	Open source licenses are legal agreements that govern the use and distribution of software. They typically allow users to view, modify, and distribute the source code.
How long does it last?	20 years from the date of grant	15 years from the date of grant	20 years from the date of grant	Indefinite, as long as it is used in commerce	Indefinite, as long as it remains a trade secret	Life of the author, plus 70 years after death	Varies by license
Is it subject to government regulation?	Yes, the Plant Patent Act and the Plant Variety Protection Act are subject to government regulation.	Yes, the Plant Variety Protection Act is subject to government regulation.	Yes, the Patent Act is subject to government regulation.	Yes, the Trademark Act is subject to government regulation.	Yes, trade secrets are subject to government regulation.	Yes, copyright is subject to government regulation.	Yes, open source licenses are subject to government regulation.
Is it binding on third parties?	Yes, the Plant Patent Act and the Plant Variety Protection Act are binding on third parties.	Yes, the Plant Variety Protection Act is binding on third parties.	Yes, the Patent Act is binding on third parties.	Yes, the Trademark Act is binding on third parties.	Yes, trade secrets are binding on third parties.	Yes, copyright is binding on third parties.	Yes, open source licenses are binding on third parties.

Please review your order. (1 item[s])

Accession	Name	Taxonomy	Amount	Form	Genebank	Comment
PI 321640	22316	<i>Vigna unguiculata</i> (L.) Walp. subsp. <i>unguiculata</i> Unguiculata Group	25	Seed	59	 ✖ Remove

*Intended use for this germplasm:

*Please provide sufficiently detailed objectives for using this germplasm. This field requires a minimum of 150 characters. NPGS germplasm is not available for individual, home, or community gardening; educational objectives are typically considered only for college-level projects. All requests are evaluated for their appropriateness to the objectives. In some cases, NPGS may contact you for additional information.

Your objectives. (Minimum 150 characters required)

Special instructions for the order:

(optional)

Selecting High Quality Breeding Material

Resources & Considerations for Independent Plant Breeders



OSA Webinar – January 17th, 2023
Emily Rose Haga



About Me:

Gardener, Seed Saver, Plant Breeder

- Education:
 - B.S. Horticulture – UW Madison
 - M.S. Plant Breeding & Genetics – UW Madison
- Past Work:
 - Tomato & Pepper Breeder – Johnny's Selected Seeds
 - Executive Director – Seed Savers Exchange
- Current Work:
 - Seed Advisor & Plant Breeding Consultant
 - Board Member – Organic Seed Alliance










Key Topics for Review:

1. How to access heirloom & open-pollinated varieties in the Seed Savers Exchange Collection (a public-access seed & plant bank)
2. Working with breeding materials developed by public plant breeders at land grant universities
3. Considerations to be mindful of when looking for new sources of breeding material



Seed Savers Exchange = A Public Access Seed Bank

- Unique and under-utilized resource for plant breeders
- >20,000 culturally, regionally, and historically significant varieties of vegetables, fruits, flowers, herbs, spices, & grains
- Criteria for SSE Collection:
 - Family Heirlooms
 - Historical Commercial Varieties
 - Modern Open-Pollinated Favorites
- Represents America's endangered garden heritage
- A great source for interesting culinary traits and pre-industrial crop adaptations
- >6,000 varieties in SSE Collection offered via The Exchange





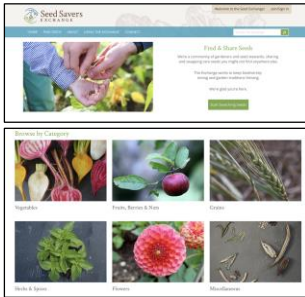
The Exchange = A Community Seed Sharing Platform

- Samples from SSE Collection can be requested via The Exchange
- 2 ways to access:
 - In Print – Request a Yearbook (cost = \$20 to cover printing/shipping costs, or free upon request with \$50 membership)
 - Online – Visit website @ exchange-seedsavers.org (cost = free, registration required)
- Membership to SSE not required – but helps organization support ongoing collection stewardship & sharing



The Exchange Yearbook

- Annual directory of seed savers and the varieties they steward that
 - Listings organized by crop, type, & variety name
 - Includes listings from SSE Collection
- >6,000 varieties currently available from the SSE Collection listed under "IA SSE HF" when:
 - Enough inventory to distribute
 - Not offered by other gardeners (*exception = tissue culture of virus-free potatoes)
- If you need assistance finding or requesting a variety from the SSE Collection, contact: exchange@seedsavers.org



The Exchange Website

- Paperless alternative & web-based complement to The Yearbook
- Searchable database with some basic filtering options to help you find:
 - rare varieties
 - listings by region
 - varieties with images & photos
- Unfortunately not as user-friendly and functional as USDA-GRIN database

Public Plant Breeders & Land Grant Universities

- Another great resource for independent breeders
- Land Grant University mission = focus on practical agricultural research to solve challenges & create new opportunities in their region
- Connecting with public plant breeders at these universities is a great way to get access to new & improved breeding materials
- Each university will have it's own process that you will have to navigate, but common elements include:
 - Material Transfer Agreements – contract that defines terms under which the material being shared is to be used for
 - Licensing & Seed Production Agreements – contract that defines the structure of royalty payments and seed production terms if something is commercialized



Considerations: Intellectual Property Rights

- Additional types of IPR considerations you may encounter when sourcing material from seed catalogs, seed swaps, or seed libraries:
 - PVP's – need permission to sell it but ok to use it in breeding & research
 - Utility Patents – need permission to sell it and to use it in breeding & research
 - OSSI Pledge – ok to use in breeding & research with commitment to keeping it in public commons (i.e. no patents)
 - Cultural – may not be legally or formally protected but ethically may only be ok to access with permission and for certain purposes
- Researching IPR Restrictions:
 - Packet Info
 - Catalog Descriptions
 - Google Searches
 - US Patent Office Searches
 - Seed Company, Breeder, or Source
 - OSA Patent Watch



Considerations: Seed Etiquette

- Things to be mindful of when requesting varieties from individuals or communities:
 - Identify yourself as a plant breeder
 - Be open and transparent about your intentions to use in research or breeding
 - Ask the source for permission to use and any terms they have for using it
- There are many different philosophies around seeds and someone may not want you to use their material for breeding / commercial purposes



Considerations: Benefits & Credit Sharing

- 5-10% royalty structure = most commonly negotiated w/independent breeders, universities, & seed companies
 - Ex: 5% of net sales if used as parent line in F1 hybrid variety
 - Ex: 10% of net sales if used directly as OP variety
- Additional royalty agreements sometimes structured around % breeding material contributing to commercialized variety's pedigree
 - Ex: 10% of net sales if 100% of pedigree is from breeding material
 - Ex: 5% of net sales if 50% of pedigree is from breeding material
 - Ex: 2.5% of net sales if 25% of pedigree is from breeding material
- Good practice to acknowledge source of any breeding material that was significant in developing your variety
- New models of voluntary benefit & credit sharing also emerging
 - Ex: Indigenous Royalties & Black Benefit Sharing @ Fedco Seeds



Thank You & Have Fun Creating!



Material Transfer Agreements (MTAs)

Michael Mazourek

Based on my experiences, not legal advice.
co-founder of Row 7 Seeds, Board of Directors for OSSI, and
a Plant Breeder at Cornell University

Written Communication of Expectations

- Memories fade
- Avoid assumptions
- People turn over
- It's easier beforehand
- Anticipate wild success
- Be thoughtful about what you sign
 - "If you don't own your masters, your masters own you."
~Prince

Documentation

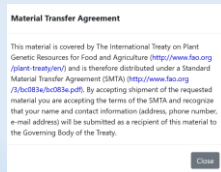
- A letter or email with a reply (non-proprietary best fit)
 - See also NIH link below
- Formal Contract
 - NIH's Uniform Biological MTA (UBMTA) is a good starting point
 - <https://grants.nih.gov/grants/guide/notice-files/not95-116.html>
 - FAO's Standard MTA (SMTA) is also interesting
 - <http://www.fao.org/3/bc083e/bc083e.pdf>
- Label seed packets to reflect agreement

Typical MTA Contents

- Recipient/Provider
- Material (Legal jargon, I'm not saying seeds are just things)
- Propagation (non-propagation/trial)
- Data
- Location/Visitation
- Liability
- Transfer
- Commercialization
- Unmodified Derivatives
- Modified Derivatives
- Patents (I'm not pro-patent)
- Expiration/Termination/Survival

Shrink Wrap or Click Wrap MTAs

- Bag tags
- Enclosures
- Website terms and conditions



Record Keeping System

- Incoming materials are accessioned
- Unique identifier placed on packet
- Correspondence saved along with accession info
- Packet retained forever
- Receipt saved with unique identifier
- Breeding records indicate all crosses with accessions
- Genome sequencing jogs memories

Parting Thoughts

- Don't cozy up to contracts, but writing it down is proper
- Contemplate success
- The world changes
- Don't sign up for more than you can manage, avoid encumbrance
- Ask for license terms upfront
- Get advice from people with experience
- For example, Prince:

"Tell me a musician who's got rich off digital sales.
Apple's doing pretty good though, right?"

Requesting Germplasm from International Resources

Example from the
World Center
avrdc.org

Why I contacted

- Specific material not available from USDA or TGRC at UC Davis
- older material from the 1950's
- diverse lines with species background
- US lines
- referenced in Asian research papers

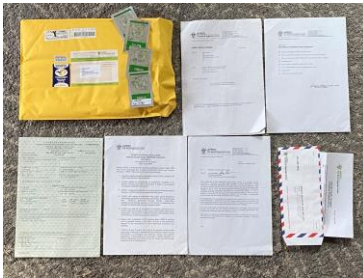


Genesys

genesys-prg.org



What I received



Materials Transfer Agreement

States conditions for the use of material by recipient, or transfer of material to third party

Original Request List

- List of requested material
- convenient for reference on desired traits

Intellectual Property Rights Guidelines

Phytosanitary Letter

- in this case AVDRC covered costs
- liability and potential tracking

Things to remember

- Time zone differences when communicating
- May take time for order (*plan ahead*)
 - Your slow season may be their busy one (hemisphere differences)
- Samples are generally small (50 seeds)
 - Account for germination
 - Account for needed population size (out breeders)

Things to Remember

- Test population for uniformity



Additional Resources

- Organic Seed Commons: <https://www.organicseedcommons.org/>
- Accessing Agrobiodiversity session at 2020 Organic Seed Growers Conference: <https://www.youtube.com/watch?v=PLZMvQJA6cDopD7i6HF1FocCotGMEq2n>
- Organic Seed Alliance's Intellectual Property Rights Table https://seedalliance.org/wp-content/uploads/2020/11/IPR-Table_Organic-Seed-Alliance_SPW_4.pdf
- On-Farm Variety Trial Guide https://seedalliance.org/wp-content/uploads/2018/03/Growers-guide-on-farm-variety-trials_FINAL_Digital.pdf
- Introduction to On-farm Plant Breeding (Organic Seed Alliance) <https://seedalliance.org/publications/introduction-to-on-farm-organic-plant-breeding/>
- Collaborative Breeding Network Website <https://www.eorganic.info/collaborativebreeding>

Upper Midwest Collaborative Plant Breeding Network



National Institute of Food and Agriculture
U.S. DEPARTMENT OF AGRICULTURE
