April 4, 2014

Amendment to Section F. for UC Beija Flor

F. Maintaining Seed Stock classes.

Production of Foundation, Registered, and Certified classes of seed are required, as requested by the California Dry Bean Advisory Board and its Baby Lima Council. Foundation stock will be refreshed every 3 years. This is because lima beans have a variable (but relatively high) frequency of insect-vectored outcrossing. Recent industry experiences with outcrossing of UC Luna BBL and Dompe 95 BLL serve to reinforce the importance of regular seed renewal with adequate isolation. Large and garden limas can also be a source of contamination for baby lima seed fields. Therefore, a geographic isolation of at least \( \frac{1}{2} \) mile is required for production of Foundation seed, at least 300 feet for Registered, and at least 30 feet for Certified seed of Beija-Flor. Most important is the elimination before flowering of any/all vine plants arising from outcrossing. A reserve of 100 lbs. of 2008 Breeder seed is maintained at UCD Field Headquarters. These isolation distances will come into force on April 7, 2014, at which time they will replace the distances specified previously by S. Temple. They will remain in force for a period of three years. Before the end of the three-year period, these isolation distances will be reviewed by the breeder-in-charge, Foundation Seed Program, and California Crop Improvement, and adjusted if necessary.
August 29, 2011

Dr. Larry Teuber
California Crop Improvement Association
Parson Seed Certification Center
University of California
One Shield Avenue
Davis, CA 95616

Dear Larry,

By this memo, we as the director of the Foundation Seed Program and the plant breeder for beans, would like to request an exception to policy and have accepted for 2011 an isolation standard of 30 feet rather than half a mile for the production of Certified class seed of UC Beija Flor and UC Haskel beans.

In the future, the isolation standard of half a mile will be adhered to for both UC Beija Flor and UC Haskel.

Respectfully,

[Signature]
Chris van Kessel
Director FSP

[Signature]
Steve Temple
Plant Breeder
May 12, 2014

Dear Certified Bean Seed Producers,

This is to inform you that the additional certification requirements for UC Haskell and UC Beija-Flor have been modified (reduced) so that the minimum isolation distances required for production within the certification program are as follows:

- Foundation Seed – ½ mile
- Registered Seed – 300 feet
- Certified Seed – 30 feet

The UC Davis bean breeder, Dr. Paul Gepts, will review the adequacy of these distances before the end of three years, and if insufficiencies are observed, these distances may be adjusted as necessary. If future adjustments are made, you will be informed by the CCIA.

For future reference, please take note of the statement that is found preceding the individual crop standards on the CCIA website: http://ccia.ucdavis.edu/seed_cert/seedcert_index.htm, which states,

“Applicants please note: Some plant breeders place additional requirements for certification in the variety description. The applicant is responsible for being aware of and following any additional requirements (i.e. greater isolation distance) for certification as contained in a variety description.”

If you have any questions concerning additional certification requirements for any variety you are producing, do not hesitate to contact the CCIA.

Sincerely,

Timothy Blank

California Crop Improvement Association
Desk – 530-754-4854
Mobile – 530-574-6459
Timothy and Paul:

I think those distances are pretty much a minimum, but ok by me. If anyone in the industry has an issue with ½ mile just remind them of the fiasco some 6-8 years ago with Luna planting stocks that contained maybe 25% viners! So much depends on the flight patterns of honeybees, and there isn’t really a distance that will resolve that issue.

Steve.

From: TIMOTHY BLANK
Sent: Tuesday, November 26, 2013 12:35 PM
To: STEVEN TEMPLE
Cc: Paul Gepts
Subject: UC Beija-Flor question

Steve,

I’d prefer not to resurrect all the confusion from a couple years ago, but I needed a little clarity so I can make sure our records are straight.

The original variety description we received for UC Beija-Flor did not mention the Registered class. I asked you if there was a Registered class, and you indicated “I believe the final decision (from discussions with the lima and Board reps) was to include a Registered class for UC Beija-Flor.” With that note, we have recognized the Registered class. As you recall, we have used your recommendations for isolation distance as variety-specific standards, but as the original description for UC Beija-Flor did not mention the Registered class, we were never given an isolation distance for the Registered class of this variety. I assume it is the same as UC Haskell, but I wanted to run this by you just to be sure.

- Foundation – 1 mile
- Registered – ½ mile
- Certified – ½ mile

Let me know.

Thanks,

Timothy
Variety: Bush Baby Lima Line 302

PI:

Steve Temple PI, Breeding Project
Department of Plant Sciences

Date

Larry R. Teuber, Director, University of California Foundation Seed Program

Date

Doug V. Shaw, Chair, Germplasm and Cultivar Release Committee, Department of Plant Sciences

Date

Chris van Kessel, Department Chair
Department of Plant Sciences

Date

Dean
College of Agriculture and Environmental Sciences

The signatures above complete the approval for release. Copies will be forwarded to parties above and OTT to file for intellectual property protection and to develop licensing agreements. The original file will go to the Certification Technical Committee (CTC) for review and recommendation to the CCIA Board of Directors to accept for certification. The CCIA Board of Directors is scheduled to meet in late February, May, and September. The CTC will not present a University of California cultivar to the CCIA Board of Directors for acceptance until it has been approved for release by the University of California. Acceptance by the CCIA Board of Directors is required before certification tags can be issued and seed shipped.

Robert F. Stewart, Chair, Seed Certification Committee

Date
RECORD OF INVENTION (ROI) FORM

PLEASE NOTE: COMPLETION OF THIS FORM CREATES AN IMPORTANT INVENTION RECORD BUT, ABSENT THE FILING OF A PATENT APPLICATION, DOES NOT IN ITSELF CREATE OR PROTECT PATENT RIGHTS

Section 1. Inventors
List all inventors and their employment status. (Actual inventorship will be determined by a patent attorney.)

1A. UC Davis inventors

<table>
<thead>
<tr>
<th>First and last name</th>
<th>Department or Organized Research Unit</th>
<th>For inventors with joint appointments, list non-UC Davis employer or institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Steven R Temple</td>
<td>Plant Sciences</td>
<td></td>
</tr>
<tr>
<td>Dr. Larry D Godfrey</td>
<td>Entomology</td>
<td></td>
</tr>
<tr>
<td>Michael Canevari</td>
<td>UCCE, San Joaquin County</td>
<td></td>
</tr>
</tbody>
</table>

1B. Non-UC Davis inventors (if applicable)


Section 2. Invention

2A. Short descriptive title of the invention.

A hybrid bush baby lima bean variety (BBL 302) resistant to the tarnished plant bug, Lygus hesperus.

2B. Briefly summarize the invention here. Include the novel features.

The true-breeding bush baby lima bean line UCL 302 was selected from a hybridization, and tested multiple seasons under field conditions, for seed yield and seed quality under different levels of Lygus pressure. It performed equal to or better than better than UC Luna, the current most popular bush baby lima grown in California.

2C. Detailed description of the invention. Use additional sheets as necessary and attach as an Appendix. This description, together with the attachments, should be enabling with respect to how to make and use the invention. Please attach any manuscripts, publications, and other documents to the form. (Electronic versions of the documents may be requested at a later date.)

In the 2000-2001 UCD Grain Legume greenhouse crossing program, a cross was made between the CIAT (Colombia) germplasm collection (G 25165) and the vine baby lima variety "UC Cariblanco N". Following several generations of field selection and testing, 302 emerged in 2006 as a true-breeding, F6 line. Through successive testing with other hybrid selections and against the popular variety UC Luna, (the current bush baby lima variety most widely grown in California), Line 302 performed well. Under heavy pressure from the tarnished plant bug Lygus hesperus, Line 302 has consistently out-yielded Luna, and shown slightly less seed sting damage caused by the insect pest. In the absence of Lygus, or under protected conditions, Line 302 is equal to Luna in yield and seed quality. Field tests at the UC Kearney Ag Center showed that sister selections of Line 302 carry some resistance to galling by the root knot nematode M. javanica. While nematode resistance is important for some growers, Lygus losses and heavy pesticide use is a much more generalized and more serious pest problem. UC Luna is fully susceptible to RKN.
2D. State the advantages which the invention has over alternate ways of achieving the same purpose.

Cheaper and more environmentally friendly than the standard means of controlling the Lygus pest, which is through multiple applications of insecticides. At least two of the insecticides shown to have efficacy for Lygus control are now having problems with the development of insect resistance to the chemical. It has also been shown that use of insecticides to control Lygus at flowering frequently leads to ecosystem imbalance and subsequent field problems with other insect pests. Some California lima growers are poised to attempt organic production of Bush Baby Limas with this resistant variety, which (if successful) would "lock in" the lucrative SE Asian baby lima markets for California producers and warehouses.

3. List the funding source(s) for the project under which this invention was made. If applicable, identify by contract or grant number and name the Principal Investigator/Supervisor of each.

<table>
<thead>
<tr>
<th>Funding Source/Sponsor</th>
<th>Contract or Grant Number</th>
<th>Principal Investigator/Supervisor</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Dry Bean Advisory Board</td>
<td>Annual 1-year grants for 2000-2009 (TEM 00 — TEM 09)</td>
<td>Steven Temple</td>
</tr>
</tbody>
</table>

4. This invention utilized data or materials from (check as many as apply):
- Affymetrix chips
- Celera's proprietary database
- Other proprietary sources (specify):

If any proprietary material (e.g., cell line, antibody, plasmid, computer software, or chemical compound) obtained from outside your laboratory was used to develop this invention under a restrictive written or oral transfer agreement (other than a normal purchasing agreement), please attach a copy or summary of that agreement.

5. When did you first conceive this invention?
1994

6. What is the date of the first written record (notebook, letter, proposal, drawing, etc.) of this invention? Identify the document, page numbers involved, and location of the document.

UCD Grain Legume Program field books, 1995—2008 (non-numbered pages), and...
UC Annual Research Reports, 1995 —2008

7. When did you first successfully test this invention?
2006

8. If you have disclosed this invention to non-UC personnel (including research sponsor) then indicate when, under what circumstances, and to whom. Please provide copies of abstracts, handouts, papers, posters, and other communications.

a. orally
   2006, 2007, 2008, and 2009 UC and Dry Bean Advisory Board meetings

b. in writing

c. by actual use, demonstration, handouts, or posters
   2006, 2007, 2008 UCD field days
9. Do you plan to submit a report, abstract, paper or thesis relating to this invention for publication, for presentation at a conference, or to a research sponsor? If yes, give details, including the actual or planned date of submission. If a manuscript has been accepted, give the anticipated publication date. Append a copy of the latest draft manuscript available.

NOTE: As a general rule, public disclosure, in any manner, before the date a formal patent application is actually filed in a national patent office, may result in the loss of patent rights in most foreign countries. Receipt of your Record of Invention Form by UC Davis Technology Transfer is not the same as the filing of a patent application. (While United States patent law allows inventors up to one year to file a patent application after the first printed publication, public use or sale, the loss of foreign rights often is very important to potential industrial licensees.) Please allow us up to 60 days to create and file a patent application; a rush submission can be a serious challenge.

YES, written publication to Bean Improvement Cooperative (BIC) Report, Feb, 2010

10. Identify any references, patent applications, or other publications which you are aware of and which you believe to be pertinent to this invention. Please attach a copy of each of these references, if available. Please also include 4-6 keywords related to your invention to assist us in our patent searches and marketing efforts.

None

11. List companies you believe might be interested in using, developing or otherwise commercializing this invention. If available, include the name, title, phone number and email address of a contact person for each company. Also include a statement of commercial use or potential of the invention.

This variety is of great interest to most/all California Dry Bean warehouses and shippers. It would also be very interesting to competing producers and shippers in a number of other states and countries.

12. Signatures, names, and addresses of all inventors:

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steven R Temple</td>
<td>4/9/09</td>
</tr>
</tbody>
</table>

Print Name: Steven R Temple

Job Title/Employment Position: Specialist in Coop Extension

Dept/ORU: Plant Sciences

Rm & Bldg: 1234 PES

Campus (Address if non-UC): Davis campus

City/State/Zip: Davis, CA, 95616

Telephone: (530) 752-8216

Facsimile: 752-4361

Email: srtemple@ucdavis.edu

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larry D Godfrey</td>
<td>1/7/09</td>
</tr>
</tbody>
</table>

Print Name: Larry D Godfrey

Job Title/Employment Position: Specialist in Coop Extension

Dept/ORU: Entomology

Rm & Bldg: 73 Briggs Hall

Campus (Address if non-UC): Davis Campus

City/State/Zip: Davis, CA, 95616

Telephone: (530) 752-0473

Facsimile: 

Email: ldgodfrey@ucdavis.edu

Note: if there are more inventors please provide signatures, names and addresses on an additional sheet of paper.
13. Technically Qualified Witnesses (Two Required) - invention disclosed to and understood by:

<table>
<thead>
<tr>
<th>a) Signature</th>
<th>Date</th>
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<tr>
<td>Printed Name:</td>
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<table>
<thead>
<tr>
<th>b) Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printed Name:</td>
<td></td>
</tr>
</tbody>
</table>

Our office may request electronic versions of the ROI, abstract, manuscript, and other documents, at a later date, in addition to the original printed and signed documents.

If you do not receive an acknowledgment within 30 days, please call Technology Transfer at (530) 757-3432.

Note: Please do not disclose to others the above invention information, except as described in item 9, without the prior notification to UC Davis Technology Transfer or the UC Office of Technology Transfer.
10. Identify any references, patent applications, or other publications which you are aware of and which you believe to be pertinent to this invention. Please attach a copy of each of these references, if available. Please also include 4-6 keywords related to your invention to assist us in our patent searches and marketing efforts.

11. List companies you believe might be interested in using, developing or otherwise commercializing this invention. If available, include the name, title, phone number and email address of a contact person for each company. Also include a statement of commercial use or potential of the invention.

12. Signatures, names, and addresses of all inventors:

<table>
<thead>
<tr>
<th>Signature</th>
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</thead>
<tbody>
<tr>
<td>Mick Canevari</td>
<td>4/16/09</td>
</tr>
</tbody>
</table>

Print Name
Mick Canevari

Job Title/Employment Position
UCCE Farm Advisor

Dept/ORU
San Joaquin County Coop Extn

Rm & Bldg

Campus (Address if non-UC)
2101 East Earhart Ave, Suite 200

City/State/Zip
Stockton, CA, 95206

Telephone
(209) 953-6100

Facsimile
(209) 953-6128

Email
wmcanevari@ucdavis.edu

Note: if there are more inventors please provide signatures, names and addresses on an additional sheet of paper.

13. Technically Qualified Witnesses (Two Required) - invention disclosed to and understood by:

a) Signature
Printed Name:

Date

b) Signature
Printed Name:

Date

Our office may request electronic versions of the ROI, abstract, manuscript, and other documents, at a later date, in addition to the original printed and signed documents.

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Note: Please do not disclose to others the above invention information, except as described in item 9, without the prior notification to UC Davis Technology Transfer or the UC Office of Technology Transfer.
Line 302 Bush Baby Lima is an F9 progeny from the 2000-01 UCD greenhouse cross #17 of CIAT accession G25165 with UC Cariblanco N. The UC Davis Grain Legume program is the owner, and Steve Temple is the breeder. Larry Godfrey of UC Davis Entomology and Mick Canevari of San Joaquin County CE are co-inventors on the ROI. All documents and breeding history reported below are available in record books maintained at the (former “Agronomy”) field HQ’s. F1 hybrid seed was advanced to F2 in the 2001 GH planting, and the F2 field population of cross 17 was first evaluated at Davis in 2002. This and all subsequent field tests were conducted under “Lygus-unprotected” conditions unless noted otherwise.

In the F2 and F3 generations, selection was made among and within hybrid populations. Cross 17 segregated for vine/bush growth habit, seed color, adaptation and podset under heavy Lygus pressure. Among F2 plants of cross #17, 6 pods/plant were harvested from the few vine plants with good seed set and white seed. In the F3 (2003), 10 pods/plant were selected from plants with podset, fewest seed stings, and quality white grain.

In 2004, F4 bush plants with excellent crown set were bulked and advanced to 2005 evaluations of the F5 at KAC(05)20Mj, and UC Davis plot 336(05)302. An F6 single plant was harvested in the M. javanica test field at KAC, and a 5-plant mass selection and bulk were harvested at Davis to begin yield tests. In 2006 F6 trials at Davis, Westley, and WSREC, “302” equaled check variety UC Luna in yield. In 2007, detailed “IPM” tests of performance with selective use of “soft” insecticides were conducted under heavy Lygus pressure at UCD. In those tests, 302 out-yielded Luna by an average 522 Ibs/A, and in strip and yield trials at UCD, WSREC, and Westley, 302 averaged 435 Ibs/A more than Luna.

### 2007-2008 Trials Comparing Bush Baby Lima Line 302 Under Varying Lygus Pressure

<table>
<thead>
<tr>
<th>Location</th>
<th>Line 302</th>
<th>Luna Check</th>
<th>Site/Trtmt Mean</th>
<th>CV</th>
<th>LSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSREC: Strips</td>
<td>2816</td>
<td>2879</td>
<td>2861</td>
<td>12.9</td>
<td>1588 (NS)</td>
</tr>
<tr>
<td>07 Seed</td>
<td>2.0/1.0</td>
<td>3.0/3.4</td>
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<tr>
<td>Westley: Strips</td>
<td>2880</td>
<td>2825</td>
<td>2784</td>
<td>9.3</td>
<td>519 (NS)</td>
</tr>
<tr>
<td>07 Seed</td>
<td>2.3/1.3</td>
<td>1.7/1.3</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Davis: Strips</td>
<td>3755 A</td>
<td>2808 B</td>
<td>3137</td>
<td>7.8</td>
<td>338</td>
</tr>
<tr>
<td>07 Seed</td>
<td>2.0/1.8</td>
<td>1.2/2.2</td>
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<td></td>
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<tr>
<td>Davis: YT 1</td>
<td>4491 AD</td>
<td>3824 G</td>
<td>4128</td>
<td>8.6</td>
<td>579</td>
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<tr>
<td>07 Seed</td>
<td>2.0/20</td>
<td>2.0/2.0</td>
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<tr>
<td>07 Davis “Warrior”</td>
<td>4363 AB</td>
<td>3879 DE</td>
<td>4090</td>
<td>6.8</td>
<td>231</td>
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<tr>
<td>07 Davis “Steward”</td>
<td>4497 A</td>
<td>3821 DE</td>
<td>4188</td>
<td>6.8</td>
<td>231</td>
</tr>
<tr>
<td>07 Davis “Untreated”</td>
<td>4174 B</td>
<td>3768 E</td>
<td>3969</td>
<td>6.8</td>
<td>231</td>
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<tr>
<td>07 Davis IPM Mean</td>
<td>4345</td>
<td>3823</td>
<td>4167</td>
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<tr>
<td>08 Davis YT #1</td>
<td>3512</td>
<td>3336</td>
<td>3317</td>
<td>14</td>
<td>659</td>
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<tr>
<td>08 Davis YT #2</td>
<td>3442</td>
<td>3143</td>
<td>3138</td>
<td>11</td>
<td>487</td>
</tr>
<tr>
<td>08 Tracy Strips</td>
<td>3466</td>
<td>3514</td>
<td>3490</td>
<td>--</td>
<td>---</td>
</tr>
</tbody>
</table>

All sites were unprotected except the 2 “IPM” treatments and the Linden and Tracy trials.

1. Study comparing varieties with different levels of Lygus protection, using “Warrior” and “Steward”, versus “Untreated”.
2. Significant number of un-threshed pods (lost) due to equipment problems.
3. Scores of seed Quality/stings, where “1” = Excellent, .3: = Fair, and “5” = Poor.

In several trials, 302 has shown fewer Lygus seed stings than Luna. Line 302 has demonstrated adaptation in all sectors of the current baby lima production area. A complete botanical description will be part of the PVP application, but 302 BBL is 110 days from planting to cutting and with seed size 67 seeds/ounce. Parents and 2005KAC20-1Mj all showed some resistance to M. javanica root knot nematode, which continues to be pursued with UCR nematologist Phil Roberts. Luna is fully susceptible to Meloidogyne species. In 2007, 40 individual F7 GH plants were increased, and in 2008 those F8 headrows produced about 300 lbs. of Breeder seed.
California Crop Improvement Association
Parsons Seed Certification Center
One Shields Avenue
University of California, Davis, CA 95616-8541
Phone: 530-752-0544 / Fax: 530-752-4735
Web: cca.ucdavis.edu

Application for Variety Certification

Applicant Name: Steve Temple
City/State/Zip Code: Davis, CA 95616
Office: 752-8216 Cellular: 530-867-2338 Fax: 752-4361 Email: SRTemple@UCDavis.edu

Breeder Name (if other than applicant): SAME
City/State/Zip Code: Davis, CA 95616
Office: 752-8216 Cellular: 530-867-2338 Fax: 752-4361 Email: SRTemple@UCDavis.edu

INSTRUCTIONS:
which give distinctiveness. Attachments are required on items B through H.
- Provide information on all items below.
- A completed copy of a Plant Variety Protection Application is acceptable in lieu of requirements A through F.

A. Variety Name: UC Beijo-Flor
Temporary designation: BBL 302
Genus: Phaseolus Species: lunatus

B. Origin and breeding of the variety.
1. Genealogy, including public and private varieties, lines or clones used, and the breeding method.
2. Details of subsequent stages of selection and multiplication.
3. Type and frequency of variants during reproduction and multiplication. State how these variants may be identified.
4. Evidence of stability.

C. Botanical description of the variety.
Special characteristics of the seed, and of the plant, as it passes through the seedling stage, flowering stage, and the fruiting stage. Description of the mature plant, and comparison with a similar commercial variety grown under the same conditions.

Objective description of the variety.
Copy of a completed Objective Description form as provided by the Plant Variety Protection Office, if such form is available for the crop.

(continued on next page)
D. Evidence to support identity of variety.
   Provide evidence (data, graphs, photographs, etc.) supporting the identity of the variety. If
   statements or claims are made concerning performance characteristics, such as yield, tolerance
   to insects or disease, or lodging, there must be evidence to support such statements. Statistical
   analysis of data is encouraged.

E. Area of adaptation and primary use of the variety.

F. Maintaining Seed Stock classes.
   State the procedure for maintaining Seed Stock classes and number of generations variety may be
   multiplied. This information must be supplied in detail.

G. Variety Composition.
   Description of how variety is to be constituted if a particular cycle of reproduction or
   multiplication is required.

H. Additional restrictions.
   Additional restrictions, if any, with respect to geographic area of seed production, age of stand
   or other factors affecting genetic purity.

I. Sample of seed.
   Approximately 25 grams.

J. Additional information to assist Field and Seed Inspectors.
   1. Expected variability (kind and frequency).
   2. Prominent identifying characteristics of both plants and seed.
   3. Other pertinent field and laboratory information not noted previously.

K. ✔ Yes ☐ No  Will an application be submitted to the Plant Variety Protection Office?

   ✔ Yes ☐ No  If you answered YES to the above question, will Certification Option
   (Title V) be applied for?

   ✔ Yes ☐ No  Do you want the acreage certified each year to be published by AOSCA
   and the certifying agencies?

   [Signature]  3/22/10  [Date]
Application for Variety Certification
(supplementary information)

A. Variety Name: UC Beija-Flor
   Temporary Designation BBL 302, *Phaseolus lunatus*

B. Origin and breeding of the variety.
   “Beija-Flor” (UCD Line 302 Bush Baby Lima) is an F10 progeny from the 2000-01 UCD greenhouse cross #17 of CIAT accession G25165 with Vine Baby Lima variety UC Cariblanco N. The UC Davis Grain Legume program is the owner, and Steve Temple is the breeder. Larry Godfrey of UC Davis Entomology and Mick Canevari of San Joaquin County CE are co-inventors on the ROI. Dr. Phillip Roberts of UC Riverside has cooperated in 2009 nematode tests at the Kearney Ag Center. All documents and breeding history reported below are available in record books maintained at the (former “UCD Agronomy”) Field HQ’s. F1 hybrid seed was advanced to F2 in a 2001 GH planting, and the F2 field population of cross 17 was first evaluated at Davis in 2002. This and all subsequent field tests were conducted under “Lygus-unprotected” conditions unless noted otherwise.

   In the F2 and F3 generations, selection was made among and within a number of hybrid populations. Cross 17 segregated for vine/bush growth habit, seed color, adaptation and podset under heavy Lygus pressure. Among F2 plants of cross #17, 6 pods/plant were harvested from the few vine plants with good seed set and white seed. In the F3 (2003), 10 pods/plant were selected from plants with podset, fewest seed stings, and quality white grain.

   In 2004, the F4 continued to segregate for plant growth habit. 5 F4 bush plants with excellent crown set were bulked and advanced to 2005 unprotected F5 evaluations at the Kearney Ag Center *M. javanica* root knot nematode field (plot KAC(05)20Mj), and at UC Davis (plot 336(05)302). An F5 single plant with especially good nematode reaction was harvested in the *M. javanica* test field at KAC, and a 5-plant mass selection and F6 seed bulk were harvested at Davis to begin F6 yield tests.

   In 2006 the F6 of line 302 was grown in yield trials at Davis, Westley, and WSREC, where bulked seed was advanced. In 2007, detailed “IPM” tests of seed yield and quality, with selective use of “soft” insecticides were conducted on the F7 of Line 302 and other elite progenies under heavy Lygus pressure at UCD. In the winter of 2007-08, 40 F7 GH plants from Line 302 were harvested individually, and in 2008 those 40 F8 headrows produced about 300 lbs. of F9 Breeder seed. The F9 Breeder seed was planted in cooperation with UCD FSP at Triad Farms, near Davis, to give excellent isolation, and 10,674 pounds of F10 Foundation seed (dirt weight) were produced on the 2 acres. F9 seed was also retested extensively with Dr. Roberts in 2009 *M. javanica* and *M. incognita* evaluations at the Kearney Ag Center field. In those trials, F9 Breeder seed of Line 302, along with UC Luna, was used as a check variety, and for head/tail borders of the trial.

   Over the 5 generations of testing since the single F5 plant was harvested in the KAC nematode nursery, Line 302 has shown only pure breeding for plant growth habit, attractive grain type, maturity, and root knot nematode galling reaction. Those are the most significant traits for varietal purity of Bush Baby Lima for California producers. The 2009 nematode root gall and egg mass reaction at KAC was also consistent (highly resistant) in a plant-by-plant evaluation of several hundred single plant roots. This nematode reaction is in marked contrast to the nematode susceptibility of the widely grown UC Luna, the industry standard for BBL. It is also noteworthy that no vine outcross plants have been observed in any of the Line 302 tests or Breeder/Foundation increases to date.

C Botanical description of the variety.
   Dry seed, vegetative plant characteristics (seedling emergence, canopy color and architecture, flower color, leaf shape and color) and flowering and cutting date of Beija-Flor are all similar to the
industry standard UC Luna. Leaves from greenhouse-grown seedlings of Beija-Flor exhibit a pattern of light and dark green, documented in photos that will become part of the PVP application, and which is not observed in seedlings of UC Luna. Many vegetative, flowering and reproductive/seed characteristics of Beija-Flor (and the Luna check variety) vary with planting date, season, and soil/location. With a mid-May planting, Beija-Flor averages 110 days from planting to under-cutting, and has an attractive white seed weighing about 44 grams per 100 seeds. Mature plants of Beija-Flor have on occasion been observed to produce more pods near the distal end of the branches, when compared to UC Luna. The principal distinguishing features of Beija-Flor, compared to the UC Luna check, are its superior reaction to *M. javanica* and *M. incognita* root knot nematode species, and its improved seed yield and seed quality in field tests where *Lygus hesperus* populations are high.

**Objective description of the variety.** (preliminary USDA PVP data sheet is attached separately)

**D Evidence to support identity of variety.**

Provide evidence (data, graphs, photographs, etc.) supporting the identity of the variety. If statements or claims are made concerning performance characteristics, such as yield, tolerance to insects or disease, or lodging, there must be evidence to support such statements. Statistical analysis of data is encouraged.

In 2004, 5 F4 bush plants with excellent crown set were bulked and advanced to 2005 evaluations of the F5 at KAC(05)20Mj, and UC Davis plot 336(05)302. An F6 single plant was harvested in the *M. javanica* test field at KAC, and a 5-plant mass selection and bulk were harvested at Davis to begin yield tests. In 2006 F6 trials at Davis, Westley, and WSREC, "302" equaled check variety UC Luna in yield. In 2007, detailed "IPM" tests of performance with selective use of "soft" insecticides were conducted under heavy Lygus pressure at UCD. In those tests, 302 out-yielded Luna by an average 522 lbs/A, and in strip and yield trials at UCD, WSREC, and Westley, 302 averaged 435 lbs/A more than Luna.


<table>
<thead>
<tr>
<th>Location</th>
<th>Line 302</th>
<th>Luna Check</th>
<th>Site/Trtmt Mean</th>
<th>CV</th>
<th>LSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>WSREC: Strips</td>
<td>2816</td>
<td>2879</td>
<td>2861</td>
<td>12.9</td>
<td>1588 (NS)</td>
</tr>
<tr>
<td>07 Seed³</td>
<td>2.0/1.0</td>
<td>3.0/3.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Westley: Strips</td>
<td>2880</td>
<td>2825</td>
<td>2784</td>
<td>9.3</td>
<td>519 (NS)</td>
</tr>
<tr>
<td>07 Seed³</td>
<td>2.3/1.3</td>
<td>1.7/1.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davis: Strips</td>
<td>3755 A</td>
<td>2808 B</td>
<td>3137</td>
<td>7.8</td>
<td>338</td>
</tr>
<tr>
<td>07 Seed³</td>
<td>2.0/1.8</td>
<td>1.2/2.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davis: YT 1</td>
<td>4491 AD</td>
<td>3824 G</td>
<td>4128</td>
<td>8.6</td>
<td>579</td>
</tr>
<tr>
<td>07 Seed³</td>
<td>2.0/20</td>
<td>2.0/2.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>07 Davis “Warrior”¹</td>
<td>4363 AB</td>
<td>3879 DE</td>
<td>4090</td>
<td>6.8</td>
<td>231</td>
</tr>
<tr>
<td>07 Davis “Steward”¹</td>
<td>4497 A</td>
<td>3821 DE</td>
<td>4188</td>
<td>6.8</td>
<td>231</td>
</tr>
<tr>
<td>07 Davis “Untreated”¹</td>
<td>4174 B</td>
<td>3768 E</td>
<td>3969</td>
<td>6.8</td>
<td>231</td>
</tr>
<tr>
<td>07 Davis IPM Mean</td>
<td>4345</td>
<td>3823</td>
<td>4167</td>
<td>14</td>
<td>659</td>
</tr>
<tr>
<td>08 Davis YT #1</td>
<td>3512</td>
<td>3336</td>
<td>3317</td>
<td>11</td>
<td>487</td>
</tr>
<tr>
<td>08 Davis YT #2</td>
<td>3442</td>
<td>3143</td>
<td>3138</td>
<td>11</td>
<td>487</td>
</tr>
<tr>
<td>08 Tracy Strips</td>
<td>3466</td>
<td>3514</td>
<td>3490</td>
<td>--</td>
<td>---</td>
</tr>
</tbody>
</table>

All sites were unprotected except the 2 “IPM” treatments and the Linden and Tracy trials.

¹Study comparing varieties with different levels of Lygus protection, using “Warrior” and “Steward”, versus “Untreated”.

²Significant number of un-threshed pods (lost) due to equipment problems.

³Scores of seed quality/stings, where “1” = Excellent, “3” = Fair, and “5” = Poor.
In several trials, 302 seed has shown fewer Lygus seed stings than Luna seed. Line 302 has demonstrated adaptation in all sectors of the current baby lima production area. A complete botanical description is a part of the PVP application, but 302 BBL is 110 days from planting to cutting and with a seed weight of 44 grams/100 seeds in the 2008 Breeder Seed lot at UC Davis. Parent UC Cariblanco N and 2005 selection KAC20-1Mj all showed good resistance to Meloidogyne root knot nematodes. The check variety UC Luna is fully susceptible to both prominent Meloidogyne species observed in California lima production areas. In 2007, 40 individual F7 GH plants were increased, and in 2008 those F8 headrows produced about 300 lbs. of Breeder seed.

In a 2009 Meloidogyne confirmation test at Kearney Ag & Research Center, 5 single plant root systems in each of 11 paired plots of Beija-Flor and UC Luna were scored with UCR nematologist Dr. Phillip Roberts. The scale of 1 (= no galling) to 9 (= complete galling) was used to score individual roots. The grand mean score of 11 Beija-Flor plots (55 total plants) was 1.8, with a range of 1.2 to 2.6, compared to a grand mean of 7.4 for UC Luna, with a plot range of 6.4 to 8.0. These large differences are typical of earlier observations and scores comparing the susceptible UC Luna with other progenies of the resistant UC Cariblanco N.

E. Area of adaptation and primary use of the variety.

Several seasons of yield testing of Beija Flor, UC Luna, and a number of experimental lines at Five Points, Westley, and Davis, have shown that Beija Flor is very well adapted over that range of baby lima bean production (currently split between the Sutter Basin and Tracy regions).

F. Maintaining Seed Stock classes.

Production of Foundation and Certified classes of seed are recommended, and requested by the California Dry Bean Advisory Board and its Baby Lima Council. Foundation stock should be refreshed every 3 years. This is because lima beans have a variable (but relatively high) frequency of insect-vectored outcrossing, and recent industry experiences with outcrossing of UC Luna BBL and Dompe 95 BLL serve to reinforce the importance of regular renewal with adequate isolation. Large limas and garden limas can also be a source of contamination for baby lima seed fields. Therefore, it is recommended that geographic isolation of at least 1 mile be required for production of Foundation seed, and at least 1/2 mile for Certified seed of Beija-Flor. Most important is the elimination of any/all vine plants arising from outcrossing, and before flowering. A reserve of 100 lbs. of 2008 Breeder seed is maintained at UCD Field Headquarters.

G. Variety Composition.

If proper isolation and field inspections are rigorously practiced, there should be no need to go back to head-row purification and reconstitution, which was carefully executed to constitute the 2008 Breeder Seed. If head-row reconstitution becomes necessary, that process should include a family test of Meloidogyne root knot nematode reaction to eliminate all Luna BBL and other nema-susceptible bush contaminants.

H. Additional restrictions.

Increases of Foundation and Certified classes of seed should be restricted to areas of California from Fresno County (southern-most) through Colusa/Sutter-Yuba Counties (northern-most). Fields at least ½ mile distant from commercial honeybee hives should be favored, in addition to distances from commercial lima fields noted above.

I. Sample of seed.

Approximately 25 grams of 2008 Breeder and/or 2009 Foundation will be provided.
# Lima Bean (Phaseolus lunatus L.)

<table>
<thead>
<tr>
<th>Name of Applicant ($)</th>
<th>Temporary or Experimental Designation</th>
<th>Variety Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UCD Line 302</td>
<td>UCBeliz - Flor</td>
</tr>
</tbody>
</table>

**Please read all instructions carefully:**

Place the appropriate number that describes the varietal character of this variety in the boxes below. Place a zero in the first box (i.e. 0 0 0 9 or 0 9) when the number is either 99 or less or 9 or less.

1. **Type:**
   - 1 = Green Shell
   - 2 = Dry Edible
   - 3 = Dual Purpose

2. **Region of Adaptability in the U.S.:**
   - Best Adapted in:
     - 1 = Northwest
     - 2 = North Central
     - 3 = Northeast
     - 4 = Southeast
     - 5 = Southwest
     - 6 = Most Regions

3. **Maturity:** (Days from seeding to first harvest):
   - Green Shells: 0 0 1 1 0
   - Dry Seeds: 0 0 0 0 0
   - No. of days Earlier than:
     - 1 = Henderson Bush
     - 2 = Thaxter
     - 3 = Sieva
     - 4 = Florida Butter
     - 5 = King of the Garden
   - No. of days Later than: 7 7 7 7 7 7

4. **Plant:**
   - 1 = Determinate, Erect Bush
   - 2 = Indeterminate, Pole
   - 0 = Height
   - 6 8 = cm Height
   - 6 = Spread
   - 2 2 = Variable
   - mm Stalk Diameter Above First Trifoliate Leaf
   - 7 = Main Stalk:
     - 1 = Brittle
     - 2 = Wirey
     - 1 = Stout
     - 2 = Thin
   - Flower Position:
     - 1 = Low, Concentrated
     - 2 = High, Concentrated
     - 3 = Scattered
   - Pod Position:
     - 1 = Low, Concentrated
     - 2 = High, Concentrated
     - 3 = Scattered
### 5. LEAVES:

- **1. Smooth**
- **2. Wrinkled**

- **1. Dull**
- **2. Glossy**

- **Thickness**
  - **1. Thin**
  - **2. Medium**
  - **3. Thick**

- **Size**
  - **1. Small** (Sieva)
  - **2. Medium**
  - **3. Large** (Prizetaker)

- **cm Petiole Length (To Basal Leaflets of First Trifoilate Leaf)**

- **Tip Shape of Center Leaflet**
  - **1. Rounded**
  - **2. Taper Pointed**
  - **3. Sharp Pointed**

- **Pubescence - Dorsal**
  - **1. None**
  - **2. Slight**
  - **3. Considerable**

- **Pubescence - Ventral**

- **Color**
  - **1. Gray Green**
  - **2. Medium Green** (Burpee's Improved Bush)
  - **3. Dark Green** (Sieva)

### 6. FLOWERS:

- **Color**
  - **1. White**
  - **2. Cream**
  - **3. Pink**
  - **4. Lilac**
  - **5. Purple**
  - **6. Other**

- **Racemes**
  - **cm to Base of Terminal Floret**
  - **Variable**

- **Number of Flowers per Raceme**
  - **Variable**

### 7. FRESH PODS:

- **Color**
  - **1. Light Green** (Thaxter)
  - **2. Medium Green** (Florida Butter)
  - **3. Dark Green** (Thorogreen Early)
  - **4. Other**

- **cm Length**
  - **Variable**

- **mm Width (Between Sutures)**
  - **Variable**

- **mm Thickness**
  - **Variable**

- **Curvature**
  - **1. Straight**
  - **2. Slightly Curved**

- **Spur Length**
  - **Variable**

- **Surface**
  - **1. Shiny**
  - **2. Dull**

- **Pubescence**
  - **1. None**
  - **2. Sparse**
  - **3. Considerable**

- **Number of Pods per Plant**
  - **Variable**

- **Condition of Pods at once-over Harvest**
  - **Does Not Apply**

### 8. SEEDS:

- **1. Monochrome**
- **2. Polychrome**

- **Primary Color**
  - **1. White**
  - **2. Greenish White**
  - **3. Green**
  - **4. Yellow**
  - **5. Buff**
  - **6. Tan**

- **Secondary Color**
  - **7. Brown**
  - **8. Pink**
  - **9. Red**
  - **10. Purple**
  - **11. Black**
  - **12. Other**

- **Color Pattern**
  - **1. Splashed**
  - **2. Mottled**
  - **3. Striped**
  - **4. Flecked**
  - **5. Dotted**

- **Secondary Color Location**
  - **1. Hilar Ring**
  - **2. Hilar Surface**
  - **3. Strophiole**
  - **4. Micropyle**
  - **5. Sides**

- **Hilar Ring**
  - **1. Not Present**
  - **2. Narrow**
  - **3. Wide**

- **Cotyledon Color**
  - **1. White**
  - **2. Pale Green**
  - **3. Green**
  - **4. Butterfly Shaped**

- **Vein-like under coat pattern**
  - **1. Absent**
  - **2. Present**

- **Seed Coat**
  - **1. SMO**
  - **2. WRN**

### 9. SEED SHAPE AND SIZE:

- **Hilum View**
  - **1. Flat**
  - **2. Elliptical**
  - **3. Oval**

- **Side View**
  - **1. Oval**
  - **2. Round**
  - **3. Kidney**
  - **4. Truncate Ends**

- **Cross Section**
  - **1. Flat**
  - **2. Elliptical**
  - **3. Oval**

- **gm Weight per 100 Seeds**
  - **Variable**

- **Classification**
  - **1. Sieva**
  - **2. Intermediate**
  - **3. Fordhook**
9. SEED SHAPE AND SIZE: (continued)

<table>
<thead>
<tr>
<th>Classification</th>
<th>1 = Sieva</th>
<th>2 = Intermediate</th>
<th>3 = Fordhook</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm Width (Dorsal to Ventral)</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mm Length</td>
<td>1.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. ANTHOCYANIN: (1 = Absent, 2 = Present)

<table>
<thead>
<tr>
<th>Flowers</th>
<th>Stem</th>
<th>Pods</th>
<th>Seeds</th>
<th>Leaves</th>
</tr>
</thead>
</table>

11. DISEASE RESISTANCE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

<table>
<thead>
<tr>
<th>Rust (Specify race)</th>
<th>Angular Leaf Spot</th>
<th>Anthracnose</th>
<th>Bacterial Wilt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Bean Mosaic</td>
<td></td>
<td></td>
<td>Lima Bean Mosaic</td>
</tr>
<tr>
<td>Southern Bean Mosaic</td>
<td></td>
<td></td>
<td>Curly Top</td>
</tr>
<tr>
<td>N.Y. 15 Bean Mosaic</td>
<td></td>
<td></td>
<td>Powdery Mildew</td>
</tr>
<tr>
<td>Bean Mosaic Virus 4</td>
<td></td>
<td></td>
<td>Fuscos Blight</td>
</tr>
<tr>
<td>Alfalfa Mosaic Virus</td>
<td></td>
<td></td>
<td>Pod Mottle Virus</td>
</tr>
<tr>
<td>Red Node Virus</td>
<td></td>
<td></td>
<td>Other (Specify)</td>
</tr>
</tbody>
</table>

12. INSECT RESISTANCE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

<table>
<thead>
<tr>
<th>Aphids</th>
<th>Leaf Hoppers</th>
<th>Pod Borer</th>
<th>Lygus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weavils</td>
<td>Seed Corn Maggot</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. PSYCHOLOGICAL RESISTANCE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

<table>
<thead>
<tr>
<th>Heat</th>
<th>Cold</th>
<th>Drought</th>
<th>Other (Specify)</th>
</tr>
</thead>
</table>

REFERENCES:

The following publications may be used as references in completing this form:

3. USDA Yearbook of Agriculture. 1937.

Color: Nickerson's or any recognized color fan may be used to determine the colors.

COMMENTS:
UC Haskell

- No PVP and Title V? Wait on UC decision on the matter.
- Is “light” “medium” and “heavy” referring to damage or insect presence? How are these terms quantified? Is there less “sting” on UC Haskell? How is resistance defined?
- Additional isolation requirements will be on the onus of the owner and maintainer(s) of the variety and not the certification program. If an IP program is required, this can be discussed, but is separate from certification.
- Wait on UC Decision on PVP, and then once that is made, request a amended form.

UC Beija-Flor (is there a hyphen)

- Same comments on measuring resistance as the above varieties.
- Is there a Registered class?

Return to committee.
TIMOTHY BLANK

From: STEVEN TEMPLE
Sent: Wednesday, July 07, 2010 4:20 PM
To: TIMOTHY BLANK
Subject: Haskell and Beija-Flor Info

Timothy:
I finally finished the big plantings so things have settled a bit.

Here are answers to your questions in your June 8 email. I assume that your questions are in addition to the MS Word
electronic and hard copy documents "Haskell CCIA" (Jan 22, 2010, and modified April 2, 2010), and "Beija-Flor CCIA"
(Dec 20, 2009, and modified April 1st, 2010).

- **Haskell:**
  I was asked by IA and Larry to PVP and Title V both varieties, so that is where they are headed. I am doing
  more detailed botanical descriptions for the PVP this summer.
  - "light" and "heavy" refer to insect populations during the growing season, as monitored by Dr Larry Godfrey in
    his sampling studies, and always correspond to the severity of Lygus damage (as judged by yields and seed
    stinging).
  - Haskell's Lygus resistance must at this point be claimed in terms of yield reduction (compared to the Mezcla
    standard). I have not done extensive seed sting counts on the vine baby lima trials. I assume you have copies
    of those data submitted to Dr. Shaw's release committee, and to CCIA earlier this year.
  - So "Lygus Resistance" for Haskell should be defined today as "seed yield under Lygus pressure", and the
data clearly support that distinction. In general, heavier bug pressure leads to larger yield differences favoring
  Haskell. The "Seed Quality/Stings" data in Table 5, comes from my Annual Report to the Bean Board. Those
  values, described in the footnote, are subjective, and on a scale of "1= excellent quality/no stings" to "5 = poor
  quality and severe stinging. So a score of "2.3/2.8" are the mean seed appearance and sting-frequency,
averaged over 3-6 reps. I can see from the table that some years we must have scored composite samples
  from several reps. And where Lygus pressure was light, little/no seed effects are observed.
  - As for lima isolation distances, CCIA can do whatever you please. I have dug up info for you on outcrossing
    frequencies in Phaseolus lunatus, and from that it seems clear that the old CCIA distances were not and are
    not adequate, and you can take it from there ... you have been informed and forewarned. I believe that the
    studies by Waines et.al. were in fact commissioned and paid for by CCIA, but apparently no changes in
    isolation were made at that time. Bob Stewart's memory might help us out there. If you want to get technically
    sound, you could look at the proximity of honey bee hives/colonies, and even the flight patterns of the bees. I
    have personally received more phone calls and made more field visits from contamination of lima seed stocks
    than all other bean classes combined.

- **Beija-Flor:**
  - "Lygus Resistance" in Beija-Flor has been documented by both seed yield under Lygus feeding pressure (like
    Haskell), and also by counts of Lygus stings per 100 seeds ( in on-farm tests by/with Mick Canevari at Tracy).
    All has been in comparison to/with DC Luna standard, which as a standard check is much more tolerant to
    Lygus than the Mezcla check for vine baby lima. Those data were also submitted to the release committee.
  - I believe the final decision (from discussions with the lima and Board reps) was to include a Registered class
    for Beija-Flor.
  - Original RKN data from evaluations with Dr. Phil Roberts at Kearney Ag Center is in my 2005 and 2009 field
    books. The 2009 Kearney Ag Center test was to confirm the 2005 RKN resistance, compared to the
    susceptible UC Luna check. I looked at locations throughout the RKN-infested fields where the 2 varieties
    were side-by-side, and then at the root galling scores for the 5 plants evaluated in each row. On a scale of
    1="clean"(no symptoms) to 9="root system entirely consumed by galls, the Luna scores of some 50 plants (10
    locations in field) were 8's and 7's, with some 6's and 9's. The scores for Beija-Flor roots were 2's, with
occasional 1's and 3's. I can't find the paper where I added them all up and calculated means but the
difference was nearly 3-fold (2.5 vs. 7.5).

Steve Temple, PhD
Grain Legume Breeder
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Davis, CA, 95616
(530) 752-8216 office
(530)867-2338 cell