COOPERATIVE EXTENSION
UNIVERSITY OF CALIFORNIA
Agronomy and Range Science Extension

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ORIGINAL

To: Chip Sundstrum and the CTC
From: Steve Temple, UC Davis

April 29,1999

Request for release of drybean variety "Canario 707" id. 6858 BP 5/17/99

The following information is submitted to justify the request for release of the breeding line "Canaro 707". The Canario grain type ("Canario" in Peru but referred to as "Azufrado" by Mexican producers and consumers) is highly preferred for many dishes in Mexico, Peru, and parts of Ecuador and Chile. The large, sulphur-yellow, oval bean has a very dilicate flavor, and in Lima and Mexican markets is generally the first bean to be purchased, often in spite of significant price differentials that should favor the disappearance of less-preferred but cheaper beans.

Beginning 3-4 years ago, several California growers and business interests began importing varieties of canarios, mostly from Mexico, to produce for ethnic markets in California and the US, but also with a view to exporting this high-value product to Latin American trading partners. We have seen many fields of canarios such as the variety "Peruano" that are heavily laden with seedborn Bean Common Mosaic Virus (BCMV). All of the canario varieties imported to date have proven susceptible to one or more strains of BCMV, and efforts to clean up the seed stocks have been completely unsuccessful (some after 2-3 years of attempts). There is a very real danger in the continued importation of seed from susceptible canario varieites, since they could also be carrying necrotic strains of BCMV (now renamed "BCMNV") that would attack and severely damage our California kidney cultivars.

A much less susceptible Mexican canario, known as "Mayocoba", was introduced by myself and several producer/companies a couple years back. Mayocoba has shown very high yields, but also has several negatives: 1) It has only partial BCMV resistance 2) It has a seed size significantly smaller than the preferred market canarios, and 3) It has a color that is often more buff or cream than sulphur yellow. These disadvantages of Mayocoba have caused me to continue testing and selecting within the line referred to hereafter as "Canario707", and which I now believe merits your approval as a UCD release.

Origin and breeding history: The original cross was made by the Centro Internacional de Agricultura Tropical breeding program of Dr.Steve Temple in 1984, and brought to California as the line "CAP 7" in a CIAT "VEF" shipment

by Temple in 1991. CIAT records indicate that the pedigree of the cross was "84-VA-909 x PAD 2". "PAD2" is from the cross G 6616x (G 4523x (G4523x G76)).

CAP7 was first planted in row 66 of the 1992 observation nursery at Chico, where it proved variable for flowering date, podset, grain size and shape and color, and maturity. In later (1993, 1994,1995, and 1996) tests at Davis, KAC, WSREC, and Chico, it was also observed to segregate for resistance to Bean Common Mosaic Virus (BCMV). After several seasons of bulk selection, 30 single plants were harvested from the 1996 Davis nursery for BCMV screening (with Bob Gilbertson and Pablo Guzman), and in 1997 the line entered yield testing by the UCD grain legume breeding program. Only two of the 30 families were found segregating for 3 BCMV-susceptible plants, and those families were eliminated. 8-10 plants with excellent grain size and color were bulked from each of the resistant families. Some 200 pounds of breeder seed are available from a 1998 increase at UCD.

The reselected line has larger seed and a more stable sulfur-yellow seed color, a more consistent podset under a range of test locations and planting dates in the Central Valley, and an absence of BCMV-infected plants. For purposes of comparison, Canario 707 has the seed size (40 grams/100 seeds) and color of preferred grains like the Mexican-bred "Peruano", but combined with the dominant (hypersensitive) "I-gene" resistance to BCMV. "Mayocoba" has recessive resistance to most California strains of BCMV, but the grain size is 34 grams/100 seeds, and sometimes the prized yellow color is almost absent.

Botanical Description (see attached USDA description for Phaseolus vulgaris) Canario 707 is relatively late (98- 105 days from planting to cutting, depending on date of planting and growing conditions) which is consistent with the desires of the California industry for full-season varieties particularly adapted to the long California growing season. The flower color is a lavender/soft pink tone. Plant growth habit is a very strong bush (indeterminate) that usually shows strong secondary branching (sometimes in the upper canopy) that may even continue after the initiation of flowering. Row canopy cover and light interception is complete. Folliage (typical of the canario class) is a dull, soft green, and lighter than kidney and cranberry types. This (recessive) folliage color and plant growth habit make field elimination of outcrosses relatively easy for this class.

Maximum canopy height is typically 56-60 cm. Field notes in two of the last six seasons showed the canopy to be very clean and verdant late in the season, a time that most other lines and varieties were in decline. A part of this is due to the late maturity, but the candidate line is also tolerant to the mid-late season browning

and "scalding" of folliage that sometimes leads to premature senescence of many genotypes in our UCD nurseries.
An important morphological characteristic of Canario 707 is its sensitivity to high temperature abortion, which was observed in this and many other lines in 1997-98. In the case of Canario 707, it generally results in a later, reduced set and later maturity. Nonetheless, we will recommend a May/ early June planting date.

1997 Yield Data: (cw/acre)

Variety	Stockton	Chico Early	Chico Late
Canario707	21.0 ab	28.1 b	16.7 ab
Mayocoba	23.3 a	35.6 a	18.2 a
Lassen/WK	14.5	20.1	15.0
CDRK	13.4	22.7	15.2
CELRK	20.6	23.0	16.1
cv	10.1	12.6	20.0

Chico early planted 5-8-97, and Chico late planted 6-26-97.

1998 Yield Data (cwt/acre:

Variety	UCD strip	UCD YT	Chico strip	Chico YT
Can 707	31.7		27.3	28.2 ab
Mayocoba	34.1		28.7	32.2 a
White Kid	19.9		21.4	24.6
CDRK	20.8		17.2	22.6
CELRK	24.8		23.2	22.5
cv	12.1			7.3

"YT" are replicated yield trials, while "strip trials" were large, non-replicated field blocks.

Data are presented above not only for the Mayocoba check, but also for check varieties of similar plant types (white kidney, dark red kidney, and light red kidney). The reason is to show 1) that the canarios as a class have consistently very high yields, and 2) Mayocoba in particluar has very high yields. Were it not for the smaller and off-color grain, and the susceptibility to some strains of BCMV, Mayocoba would be the variety of choice. In fact, both Mayocoba and Canario 707 are being used at UCD as parents to improve the yield potential of our kidney varieties. Seed samples harvested from the same (1998 UCD) nursery are provided.

Area of Adaptation:

It is anticipated that the variety would be recommended for the traditional common bean-growing areas of Linden/Farmington, and for most of the Sacramento Valley. It performed reasonably well in a non-replicated strip trial outside Arcata (Humboldt County), but will probably prove too late to successfully grow there every year. It is also anticipated that "Canario 707" will be of interest to direct market and "heirloom" producers because of its very unique grain color/ size, and especially in areas where there is a growing Hispanic marketshare.

Breeder seed will be maintained by the UCD Bean Breeding Program.
A limited volume of Foundation seed should be maintained by Foundation Seeds.
An attempt will be made to selectively benefit California growers in the production and marketing of the seed and commercial crop.

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
~~LIVESTOCK AND SEED DIVISION~~

Exhibit C

OBJECTIVE DESCRIPTION OF VARIETY
Dry Edible Bean (Phaseolus vulgaris L.)

NAME OF APPLICANT(S)	EXPERIMENTAL NAME	VARIETY NAME
Steve Temple	Canario 707	
ADDRESS (Street and No. or P.O. No., City, State, ZIP)		FOR OFFICIAL USE ONLY
Agronomy + Range Science, Univ. of California, One Shields Ave., Davis, CA, 95616		PVPO NO.

Provide data for all characters unless indicated as "optional." Place numbers in the boxes for the characters or numerical values which best describe this variety. Measured data should be the mean of an appropriate number of well spaced (15-20 cm) plants. The Royal Horticulture Society or any recognized color standard may be used to determine plant color. Designate the color system used below.

COLOR SYSTEM USED	LOCATION OF THE TEST(S) TO EVALUATE THIS VARIETY
	UC Davis

MARKET CLASS

[1][2]

CLASS	CHECK
1 = Navy (Pea)	Seafarer
2 = Small White	Aurora
3 = Black	Midnight
4 = Pinto	UI-114
5 = Great Northern	UI-59
6 = Small Red	NW-59
7 = Pink	Viva
8 = Cranberry	UI-50
9 = Dark Red Kidney	Montcalm
10 = Light Red Kidney	Redkloud
11 = Yellow Eye	Steuben
12 = Other (specify) Canario / Mayocoba	(check)

2. MATURITY

[3] 1 = Early (80-90 days); 2 = Medium (90-100 days); 3 = Late (>100 days)

[1][0][5] Days from planting to harvest maturity

[ ][ ][ ][ ] Heat units from planting to harvest maturity (optional). Specify base temperature used: _____

[ ][9][5] Days from planting to harvest maturity of check variety (use check appropriate to market class shown in item 1)

PLANT HABIT

[1]

TYPE
1 = Ia Bush-determinate, strong and erect stem and branches
2 = Ib Bush-determinate, weak stem and branches
3 = IIa Erect growth habit-indeterminate, guides (runners) short or not developed
4 = IIb Erect growth habit-indeterminate, guides medium to long, with no ability to climb
5 = IIIa Vine-indeterminate, short guides with no ability to climb
6 = IIIb Vine-indeterminate, long guides with ability to climb
7 = IVa Indeterminate climbing, pods distributed throughout the plant
8 = IVb Indeterminate climbing, pods concentrated on the upper part of the plant

[ ][5][8] Average height of mature plant, in cm.

[ ][5][4] Average height of check variety, in cm. (use same check as above

[3] Pod Position: 1 = Low (lower pods touching soil surface) 2 = High (lower pods not touching soil surface) 3 = Scattered (not concentrated high or low)

[2] Adaptability to machine harvest: 1 = Adapted 2 = Not Adapte

[2] Lodging resistance: 1 = Good 2 = Fair 3 = Poor

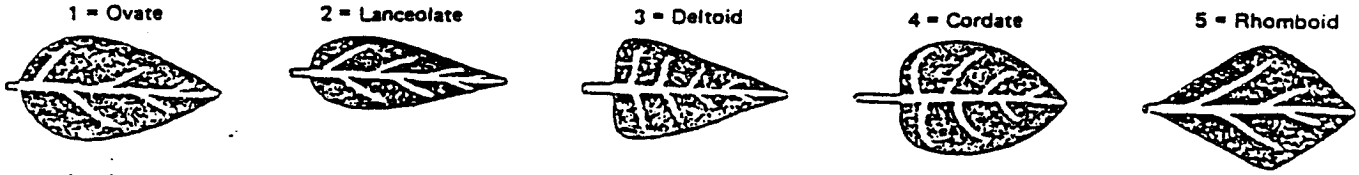
LEAFLET MORPHOLOGY (Use terminal leaflet of a fully expanded trifoliolate)

[2] 1 = Smooth; 2 = Wrinkled

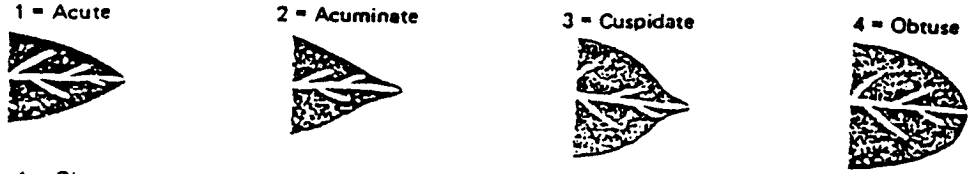
[1] 1 = Dull; 2 = Glossy; 3 = Semiglossy; 4 = Variable

Light Green Folliage

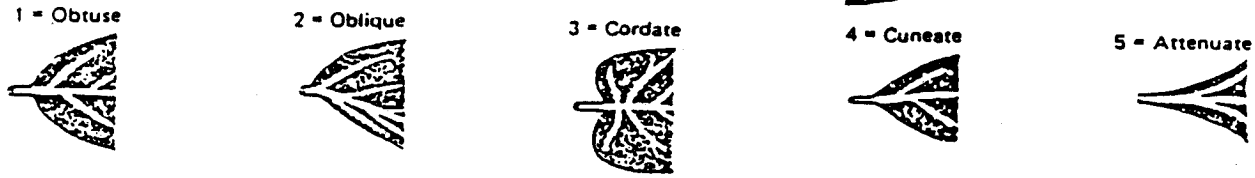
[ ] SHAPE:



[2] APEX OF LEAFLET:



[1] BASE OF LEAFLET:



[3] COLOR OF STANDARD: 1 = White; 2 = Cream; 3 = Pink; 4 = Blue; 5 = Purple

[3] COLOR OF KEEL: 1 = White; 2 = Cream; 3 = Pink; 4 = Blue; 5 = Purple

[3] COLOR OF WINGS: 1 = White; 2 = Cream; 3 = Pink; 4 = Blue; 5 = Purple

[4][2] Days to 50% bloom

6. POD MORPHOLOGY (Green pod morphology optional)

Green | Mature

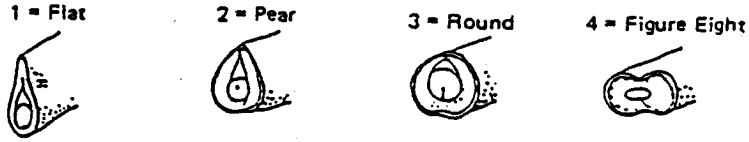
[ ] [1] COLOR PATTERN: 1 = Solid; 2 = Striped; 3 = Blotched; 4 = Mottled; 5 = Other _____

[ ] [3] PRIMARY COLOR: 1 = Purple; 2 = Red; 3 = Green; 4 = Yellow; 5 = Tan; 6 = Brown; 7 = Other _____

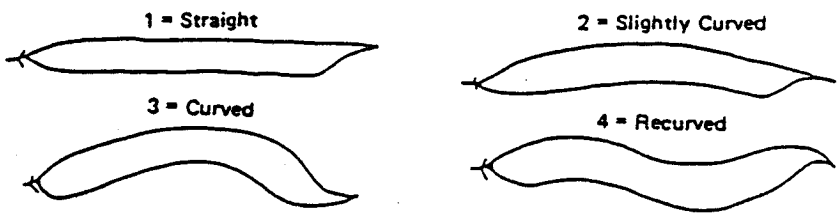
[ ] [ ] COLOR MODIFIER: 1 = Light; 2 = Light Medium; 3 = Medium; 4 = Medium Dark; 5 = Dark

[ ] [ ] SECONDARY COLOR: 1 = Purple; 2 = Red; 3 = Green; 4 = Yellow; 5 = Tan; 6 = Brown; 7 = Other _____

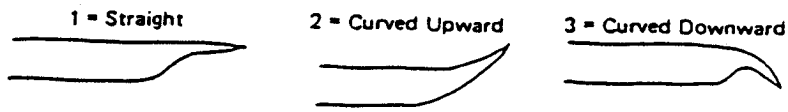
[ ] [3] CROSS SECTION SHAPE: 1 = Flat; 2 = Pear; 3 = Round; 4 = Figure Eight



[ ] [2] POD CURVATURE: 1 = Straight; 2 = Slightly Curved; 3 = Curved; 4 = Recurved



[ ] [3] POD BEAK ORIENTATION: 1 = Straight; 2 = Curved Upward; 3 = Curved Downward; 4 = Variable



Average beak length, in cm. 2

[ ] [2] CONSTRICTIONS: 1 = None; 2 = Slight; 3 = Deep

[5].[1] Average number of seeds per pod

7. SEED COLOR

[1] 1 = Shiny; 2 = Dull; 3 = Semishiny; 4 = Variable

[1] 1 = Monochrome; 2 = Polychrome

[ ][2] PRIMARY COLOR: 1 = White; 2 = Yellow; 3 = Buff; 4 = Tan; 5 = Brown; 6 = Pink; 7 = Red; 8 = Purple; 9 = Blue; 10 = Black; 11 = Other _____

[ ][3] SECONDARY COLOR: 1 = White; 2 = Yellow; 3 = Buff; 4 = Tan; 5 = Brown; 6 = Pink; 7 = Red; 8 = Purple; 9 = Blue; 10 = Black; 11 = Other _____

[1] COLOR PATTERN: 1 = Solid; 2 = Splashed; 3 = Mottled; 4 = Striped; 5 = Flecked; 6 = Dotted

[2] HILAR RING: 1 = Absent; 2 = Present

[0][1] HILAR RING COLOR: 1 = White; 2 = Yellow; 3 = Buff; 4 = Tan; 5 = Brown; 6 = Pink; 7 = Red; 8 = Purple; 9 = Blue; 10 = Black; 11 = Other _____

8. SEED SHAPE AND WEIGHT

[3] SHAPE OF SEED TAKEN FROM MIDDLE OF POD: 1 = Round; 2 = Oval; 3 = Cuboid; 4 = Kidney; 5 = Truncate Fastigiate

[4][0] Dry seed weight in g/100g seeds (adjusted to 12% moisture)

Mayacoba = 34.6g/100s