B. Origin and Breeding History of the Variety

California Blackeye 27 is the varietal name proposed for line H8-8-27 of the UC Riverside blackeye breeding program. Line H8-8-27 was developed from a single plant selection made in 1992 from UCR breeding line H8-8. Line H8-8 was developed using the pedigree breeding procedure from a cross between UCR breeding lines 336 and 1393 made in 1986. UCR breeding line 336 was the result of a cross between CB5 and CB3 made in 1983. UCR breeding line 1393 was developed from a three-way cross involving heat tolerant accessions 'Prima' and TVu4552 made in 1981, and then UC Davis breeding line 7977 in 1983. UCD 7977 has a pedigree of PI166146/CB5//CB5.

C. (1) Botanical description of the variety.

Breeding line H8-8-27 has similar botanical characteristics as California blackeye cultivars CB5, CB46 and CB88. For example, it has white flowers, similar leaf size and shape, foliage color and red pigmentation at the stem and branch nodes.

C. (2) Objective description of the variety.

The phenological development of line H8-8-27 is similar to CB46. With a May sowing date and typical growing conditions in the San Joaquin Valley, line H8-8-27 begins flowering about 52 days after sowing and matures its first flush of pods in about 95 days from sowing. Line H8-8-27 has an erect 'bush' growth habit and is substantially more compact than CB5 and CB88, and slightly more compact than CB46.

D. Evidence supporting the identity of the variety and any statements or claims made concerning its performance characteristics.

Line H8-8-27 and the commercially available California blackeye varieties CB46, CB88 and CB5 carry the nematode resistance gene '*Rk*' that confers strong resistance to common strains of *Meloidogyne incognita* root-knot nematode. Line H8-8-27 also carries an additional gene that broadens the effectiveness of this resistance by providing protection against *Rk*-virulent forms of *M. incognita* and *M. javanica* root-knot nematodes not controlled by gene *Rk* alone. Reproduction and root galling on line H8-8-27 caused by *Rk*-virulent *M. incognita* and *M. javanica* are about half that observed on CB46 and CB88 (Table 1).

Line H8-8-27 has resistance to both Race 3 and Race 4 of Fusarium wilt (*Fusarium oxysporum* F.sp. *tracheiphilum*), while CB46 and CB88 only have resistance to Race 3 of this disease (Table 2). CB5 is susceptible to both Race 3 and Race 4. Race 3 is the predominate race of Fusarium wilt in California, but additional fields with Race 4 were identified in 1997 and 1998, suggesting that this race is spreading. Line H8-8-27 has out-performed CB46 and CB88 where Fusarium wilt Race 4 and a gene *Rk*-virulent strain *M. incognita* root-knot nematode were present in trials conducted in fields near Denair, CA in 1995 and 1996. Line H8-8-27 yielded 21.0 and 24.5 cwt/ac while CB46 yielded 16.5 and 20.8, and CB88 yielded 11.5 and 10.2 cwt/ac in 1995 and 1996, respectively. The yield of line H8-8-27 appears to be substantially greater than CB46 and CB88 in the presence of Race 4 Fusarium wilt and gene *Rk*-virulent strains of root-knot nematodes.

Preliminary and advanced field tests of line H8-8-27 were conducted from 1992 to 1994. From 1995-1998, replicated yield trials were conducted at several sites in the San Joaquin Valley in Uniform Trials in collaboration with the UC Davis based Statewide Dry Bean Testing Program. These tests were conducted in fields free from Race 4 Fusarium wilt and *Rk*-virulent root-knot nematodes and indicate that the yield potential of line H8-8-27 is equivalent to CB46 (Table 3).

Line H8-8-27 has heat tolerance that enhances pod set under high temperature conditions that are commonly encountered in the southern San Joaquin Valley. Minimum night temperatures greater than 64 °F (18 °C) during the early reproductive period of the crop cause reductions in podset of CB46, CB88 and CB5, but less so with line H8-8-27. H8-8-27 produced 2320 and 1330 lb/ac compared to 1800 and 380 lb/ac for CB5 in field trials conducted specifically to measure the effects of heat tolerance on grain yields at the Shafter Field Station and the UCR Coachella Valley Agricultural Field Station, respectively, in 1996 (See Ismail, A. M. and A. E. Hall. 1998. Crop Sci. 38: 381-390). Line H8-8-27 also has produced higher yields than CB46 at locations having hot temperatures during the reproductive period of the crop (Table 3).

Line H8-8-27 has a bright white seed coat and typical blackeye bean appearance. The seed shape is similar to CB5, slightly flatter and less round than CB46. Its individual seed weight is about the same as CB46 (Table 4). The seed does not 'leak' dark pigments when soaked or canned and it has had higher quality dry grain ratings than CB46 in evaluations performed by grading experts. Line H8-8-27 was rated USDA Grade No.1 compared to USDA Grade No. 3 and No. 2 in two 'on-farm' strip plantings grown in 1997 and 1998, respectively.

Line H8-8-27 can be harvested and cleaned with conventional commercial harvesting and cleaning equipment. Three different commercial harvesting companies have harvested large lots of line H8-8-27 in 1996, 1997 and 1998 without observing unusual levels of seed cracking or other problems. Canning tests by S&W Foods, Modesto, CA and Michigan State University of grain grown in two locations in 1996 and 1997 suggest that this line has excellent canning quality.

E. Area of adaptation.

Line H8-8-27 has performed well in replicated yield tests in the major blackeye growing areas of the state, i.e. in the San Joaquin Valley from Modesto south to Bakersfield. It has not been tested in the in blackeye growing areas near Sacramento, where a small amount of the crop is produced. Line H8-8-27 is well adapted to single- (90-110 day) and double-flush (120-150 day) production systems that use 30" beds. The variety is slightly more compact than CB46, and is less well suited to single-row planting on 40" beds than viny vigorous varieties such as CB5 and CB88. Line H8-8-27 should perform well on double-row, 40" bed systems, based on its compact growth habit and high harvest index and limited yield data supports this hypothesis (see 1998 Shafter spacing trial results in Table 3). Line H8-8-27, CB46, CB88 and CB5 are all susceptible to 'early cut-out disease' and none of these varieties is recommended for double-flush production in fields with a history of this problem.

F. Procedure for Maintaining Stock Seed, etc.

The specifications for beans of the California Crop Improvement Association are to be followed. Foundation seed is to be planted to produce certified seed. The Foundation Seed Project will maintain foundation seed. The Foundation Seed Project will be supplied with about 40 lbs. of breeder's seed for planting in 1999.

FDN → CERT.
BY EARL BOOTH
PER DISCUSSION W/ TONY HALL

Table 1. Comparison of H8-8-27 and CB46 for reproduction (number of egg masses) of *Rk*-avirulent and *Rk*-virulent *M. incognita* and *M. javanica* root-knot nematodes in growth chamber 'pouch' tests and field ratings of root galling in the presence of these nematodes.

	Rk-avirulent *M. incognita*		*Rk*-virulent			
			M. incognita		*M. javanica*	
Line	Reprod.	Gall[1]	Reprod.	Gall[2]	Reprod.	Gall[2]
	-no.-	score	-no.-	score	-no.-	score
H8-8-27	0	0	70	2.1	71	2.3
CB46	2	0.03	150	4.7	207	4.9
CB88	1	0	176	5.1	227	4.5
Sus. Check[3]	211	0.60	135	2.0	367	6.8
$L.S.D._{(0.05)}$	17	0.15	47	0.9	53	0.6

[1]Gall=Galling scores based on a standardized scale-0=no detectable galling to 4=heavily galled
[2]Gall=Galling scores based on a standardized scale-0=no detectable galling to 10= heavily galled.
[3] Susceptible check is either CB3 or H8-9; both lines do not carry gene *Rk*

Table 2. Average scores for reaction of H8-8-27, CB3, CB5, CB46, and CB88 to Races 3 and 4 of Fusarium wilt (*Fusarium oxysporum* F.sp. *tracheiphilum*) in seedling root-clip-dip innoculation tests conducted in a greenhouse, averages of six replicate pots with two plants per pot, Spring 1995.

	Average score*		
Genotype	Race 3	Race 4	Classification
H8-8-27	0.0	0.1	Resistant to Races 3 & 4
CB3	0.3	0.4	Resistant to Races 3 & 4 (resistant parent)
CB5	2.3	3.9	Susceptible to Races 3 & 4 (susceptible check)
CB88	0.0	4.7	Resistant to Races 3; susceptible to Race 4

*Plants scored 43 days after innoculation on 0-5 scale where 5=plant dead, 4=80 to 100% of leaves chlorotic; 3=30 to 79% of leaves chlorotic; 2=1 to 29% of leaves chlorotic; 1=slight dwarfing and vascular discoloration in stem cross-section; 0=no symptoms.

Table 3. Trial mean grain yield and grain yields of H8-8-27 and CB46 and their difference in yield in uniform, spacing and strip trials conducted in 'clean' fields in the San Joaquin Valley from 1995-1998 under the primary blackeye cropping systems used in California.

Trials on 30" beds conducted as early planted, single-flush (90-110 day) crop:

Year	Location	Type	Trial Mean	H8-8-27	CB46	Difference	Comments
			----------lb/ac----------				
1995	Kearney	Uni.	3230	3830	3170	+660*	
1996	Kearney	Uni.	2410	2610	2550	+ 60	
1996	Westside	Uni.	2370	2450	2460	- 10	
1997	Westside	Uni.	1960	1790	1990	-200	
1998	Shafter	Spa.	2420	2720	2470	+250	Hot loc./year
Mean			2480	2680	2530	+150	

Trials on 30" beds conducted as a double-flush (125-145 day) crop:

1995	Shafter	Uni.	5410	5590	5590	0	
1996	Shafter	Uni.	4680	5310	4660	+650*	Hot loc./year
1997	Shafter	Uni.	4000	4450	5230	- 780*	
1998	Shafter	Uni.	4500	5160	4730	+430	Hot loc./year
1995	Kearney	Uni.	4060	4190	4720	- 530*	
1996	Kearney	Uni.	3830	3800	4050	- 250	
1998	Kearney	Uni.	4330	4630	4270	+360	
Mean			4400	4730	4750	- 20	

Trials conducted single rows on wide (38-40") beds (double-flush except 1998 Shafter):

1996	Tulare	Uni.	4440	4260	4910	-650	
1998	Tulare	Uni.	4780	4570	4760	-190	
1997	Wasco	Strip	4500	4400	4400	- 0	
1998	Shafter	Spa.	2320	2400	2330	+70	Hot loc./year
Mean			4010	3910	4100	- 190	

Double row trial on wide (38-40") beds (single-flush)

1998	Shafter	Spa.	2270	2640	2500	+140	

*Significant difference between H8-8-27 and CB46 at $P<0.05$.
Uni.=uniform trial; Spa.=row spacing trial; Strip=on-farm large scale strip trial.

Table 4. Individual seed weight of H8-8-27 and CB46 and the difference between them in uniform, spacing, and strip trials conducted in the San Joaquin Valley from 1995-1998 in the primary cropping systems used in California.

Trials on 30" beds conducted as early planted, single-flush (90-110 day) crop:

Year	Location	Type	H8-8-27	CB46	Difference
			---------g/100 seeds----------		
1995	Kearney	Uni.	20.3	20.5	- 0.2
1996	Kearney	Uni.	21.3	19.7	+1.6*
1998	Shafter	Spa.	23.8	23.0	+0.8
Mean			21.8	21.1	+0.7

Trials on 30" beds conducted as a double-flush (125-145 day) crop:

1997	Shafter	Uni.	21.7	21.8	- 0.1
1998	Shafter	Uni.	22.6	22.8	- 0.2
1995	Kearney	Uni.	21.3	20.0	+1.3*
1998	Kearney	Uni.	22.6	21.9	+0.7
Mean			22.1	21.6	+0.5

Trials conducted with single rows on wide (38-40") beds (double-flush except 1998 Shafter):

1998	Tulare	Uni.	21.9	21.7	+0.2
1997	Wasco	Strip	24.1	21.7	+2.4
1998	Shafter	Spa.	23.3	21.9	+1.4*
Mean			23.1	21.8	+1.3

Double row trial on wide (38-40") beds (single-flush)

1998	Shafter	Spa.	23.7	23.3	+0.4
Overall mean			**22.4**	**21.7**	**+0.7**

*Significant difference between H8-8-27 and CB46 at $P<0.05$.
Uni.=uniform trial; Spa.=row spacing trial; Strip=on-farm large scale strip trial.

FORM APPROVED: OMB NO. 40-R3822

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION
BELTSVILLE, MARYLAND 20705

OBJECTIVE DESCRIPTION OF VARIETY
(Cowpea)

INSTRUCTIONS: See Reverse

NAME OF APPLICANT(S)	VARIETY NAME OR TEMPORARY DESIGNATION
Jeffrey D. Ehlers and Anthony E. Hall	CB27 tested as H8-8-27
ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code)* Botany and Plant Sciences University of California, Riverside, CA 92521	**FOR OFFICIAL USE ONLY** PVPO NUMBER

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g. [0][8][9] or [0][9]) when number is either 99 or less.

1. PLANT HABIT AT GREEN SHELL STAGE: [1] 1 = ERECT 2 = SEMIERECT 3 = PROCUMBENT 4 = PROSTRATE

2. PLANT SIZE: [6][0] CM. HIGH AT MATURITY

3. STEM COLOR: [1] 1 = GREEN 2 = PURPLE

4. NODE COLOR: [2] 1 = GREEN 2 = PURPLE

5. FOLIAGE: [2] 1 = OPEN 2 = COMPACT

6. LEAF COLOR (See Reverse): [3] 1 = LIGHT GREEN 2 = MEDIUM GREEN 3 = DARK GREEN

7. LEAF SURFACE: [2] 1 = SMOOTH 2 = BLISTERED

[2] 1 = DULL 2 = GLOSSY

8. FLOWER COLOR (See Reverse) [4] 1 = PURPLE 2 = LAVENDER 3 = TINGED 4 = WHITE

9. FIRST FLOWERING [5][2] NUMBER OF DAYS

10. POD:

[3] PLACEMENT: 1 = BELOW FOLIAGE 2 = ABOVE FOLIAGE 3 = AT FOLIAGE LEVEL

[2] LOCATION: 1 = SCATTERED 2 = BUNCHED

[1][8] CM. LONG [1][0] MM. WIDE

[2] CURVATURE: 1 = STRAIGHT 2 = CURVED

[2] CONSTRICTIONS: 1 = NONE 2 = SLIGHT 3 = DEEP

[1] SURFACE *(Green shell maturity)*: 1 = DULL 2 = GLOSSY

[2] COLOR *(Green shell maturity)*: 1 = SILVER-GREEN 2 = GREEN 3 = LIGHT PURPLE 4 = DARK PURPLE

[2] COLOR *(Dry maturity)*: 1 = WHITE 2 = STRAW 3 = DRAB 4 = PURPLE

[1] CROSS SECTION *(Green shell stage-width/height)*: 1 = (1: <) 2 = (1: >) 3 = (1:1)

11. SEED:

[0][9] NUMBER OF SEEDS PER POD

[1] SHAPE *(See Reverse)*: 1 = KIDNEY 2 = OVATE TO OVOID 3 = CROWDER 4 = GLOBOSE 5 = RHOMBOID

[1][2] MM. LONG

[0][7] MM. WIDE

[5] HILAR EYE TYPE:

[2][2][4] GM. PER 1000 SEEDS

SPECKLED BLOTCH NARROW BIG SMALL VERY SMALL

[1] COAT: 1 = WRINKLED 2 = SMOOTH

[2] COLOR PATTERN: 1 = SINGLE COLOR 2 = PATTERNED 3 = MARBLED 4 = SPECKLED

[0] PRIMARY COLOR *(Single color or basic color)*: 1 = PURPLE 2 = BLACK 3 = DULL BLACK 4 = BLUE 5 = RED 6 = COFFEE 7 = MAROON 8 = BUFF OR CLAY 9 = PINK 0 = WHITE

SECONDARY COLORS PRODUCING THE PATTERN, MARBLING OR SPECKLING (Enter a zero in boxes where the colors do not identify the secondary colors.):

[0] 1 = PURPLE [1] 2 = BLACK [0] 3 = DULL BLACK [0] 4 = BLUE [0] 5 = RED

[0] 6 = COFFEE [0] 7 = MAROON [0] 8 = BUFF [0] 9 = PINK [0] 0 = WHITE

FORM LPGS-470-4 (8-80) (Formerly Form GR-470-4 (7-76) which may be used)

12. DISEASE (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[2] FUSARIUM WILT	[2] ROOT KNOT NEMATODE	[0] CHARCOAL ROT	[0] ZONATE LEAF SPOT
[0] RED LEAF SPOT	[0] POWDERY MILDEW	[0] COWPEA CHLOROTIC MOTTLE VIRUS	[0] SOUTHERN BEAN MOSAIC VIRUS
[0] BEAN YELLOW MOSAIC VIRUS	[0] CUCUMBER MOSAIC VIRUS	[0] BEAN POD MOTTLE VIRUS	[0] SOYBEAN CYST NEMATODE
[0] COWPEA YELLOW MOSAIC VIRUS	[0] BACTERIAL CANKER	[0] CERCOSPORA LEAF-SPOT	[0] STING NEMATODE
[0] RUST	[0] SOUTHERN BLIGHT	[0] ROOT ROT	[ ] OTHER *(Specify)*_____

13. INSECT (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

[0] MEXICAN BEAN BEETLE	[1] COWPEA APHID	[0] COWPEA CURCULIO	[0] STINK BUGS
[0] LESSER CORNSTALK BORER	[0] EUROPEAN CORNBORER	[0] CORN EARWORM	[0] BEET ARMYWORM
[0] THRIPS	[0] SERPENTINE LEAF MINERS	[1] OTHER *(Specify)* Lygus	

14. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant size	CB46	Plant habit	CB46
Pod size	CB46	Plant pigmentation	CB46
No. days to maturity	CB46	Seed coloration	CB46

INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for completing this form:

1. C. V. Piper, 1912, Agricultural Varieties of Cowpea and Related Species, U.S.D.A., Bulletin No. 229.
2. L. L. Ligon, 1958, Characteristics of Cowpea Varieties, Oklahoma State University, Bulletin B-518.
3. W. J. Spillman and W. J. Sando, 1929, Mendelian Factors in the Cowpea, papers of the Michigan Academy of Science, Arts and Letters, Vol. XI.

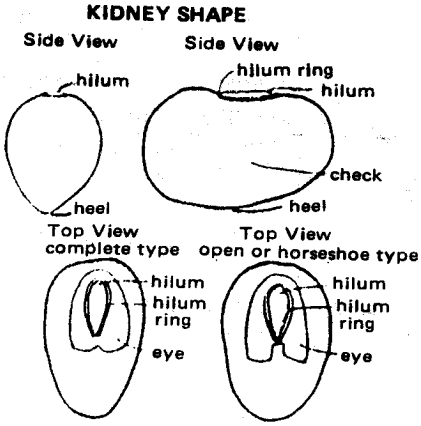
LEAF COLOR: Any recognized color chart may be used to determine the leaf color of the described variety. The following cowpea varieties may be used as a guide to identify colors listed:

1. Light Green - Texas Cream 40
2. Medium Green - Big Boy
3. Dark Green - California Blackeye #5.

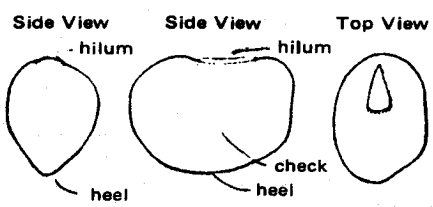
FLOWER COLOR: White flower should be treated with a one percent solution of hydrochloric acid to determine if anthocyanin is present. If color appears as a result of the test, classify as tinged.

TERMS USED TO DESCRIBE SHAPES:

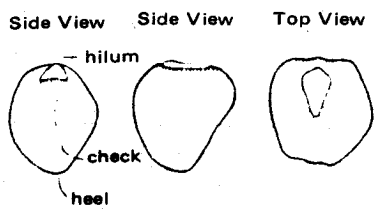
KIDNEY SHAPE



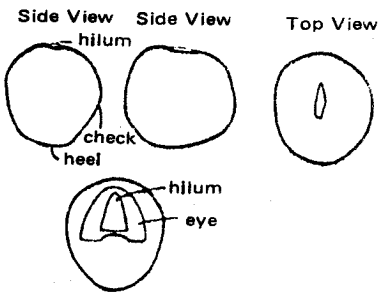
OVATE to OVOID SHAPES



CROWDER



GLOBOSE



RHOMBOID