

UC RIVERSIDE BLACK EYE IMPROVEMENT PROGRAM

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Blackeyes are a well-adapted and generally profitable rotation crop for many cotton growers in the southern San Joaquin Valley. Nematode resistant blackeye varieties help reduce soil levels of *Meloidogyne incognita* root-knot nematodes and increase soil fertility for the benefit of succeeding cotton crops. Improved varieties are needed for the California blackeye industry to remain competitive with other producing areas such as the High Plains of Texas. UC Riverside has been breeding and testing improved blackeyes for nearly twenty years. The Shafter Station has been an ideal, representative yield-testing site for the products of our breeding program for the last seven years. As a result of these efforts, we released the blackeye variety California Blackeye No. 27 (CB27) in 1999. (See attached description of CB27). CB27 has high yield potential (see Table 2), heat tolerance, improved broad-based resistance to root-knot nematodes (*Meloidogyne incognita* and *M. javanica*) and resistance to the two races of Fusarium wilt present in California (see Table 1). CB46 only has strong resistance to one race of Fusarium wilt and to only one of three strains of root-knot nematodes present in California. CB27 also has seed that is brighter white than CB46 and generally larger in size.

We are conducting three field experiments on the Shafter Research Station in 1999. These experiments were planted May 11, 1999.

Blackeye Uniform Trial: We are evaluating the grain yield and grain quality of 10 advanced blackeye breeding lines from the UCR and UCD blackeye breeding programs, the standard variety 'CB46' and the recently (June 1999) released variety 'CB27' under early sown, long season (>130 days) management. Most entries in this trial have resistance to two races of Fusarium wilt and some have stronger resistance to root-knot nematodes than CB46 (Table 1). This trial is part of a set of 'Uniform Trials' with common entries conducted jointly by the UCR and UCD programs at three locations in the San Joaquin Valley.

Row Spacing Trial: With the development of newer compact blackeye varieties such as CB46 and the recently released CB27, a re-examination of variety x row spacing effects was warranted. We are evaluating the agronomic performance of 6 lines with contrasting plant habit (3 compact lines-CB46, CB27, and H36, and 3 viny lines-CB5, H8-8-1N, and UCD 8517, under single row, 30" bed, single row, 40", and double row, 40" bed systems. In a similar trial conducted at the Shafter Station in 1998, compact lines produced higher grain yields (avg. yield of 2890 lb/ac) and had higher harvest indices (avg. 47.9 %) than viny lines (avg. yield 2350 lb/ac and harvest index 39.7%) over the three production systems. Compact varieties produced their highest yields (avg. 3108 lb/ac) under the single-row 30" bed and double-row 40"bed systems. Viny varieties produced their highest yields at the single-row 40"bed) system (avg. yield of 2519 lb/ac). We anticipate similar results this year. This experiment was cut on August 27, 1999.

Screening for Lygus Resistance: Varieties with resistance to lygus bugs are needed to reduce the need for costly insecticides and because of increasing constraints on the use of pesticides. Sources of strong lygus resistance still need to be identified. We obtained a set of 144 germplasm lines native to Italy are screening these for resistance to lygus. Each accession was planted in a single row plot with two replications and frequent placement of CB46 check rows. No insecticide was applied to the crop. We had planned to evaluate the lines for their ability to flower, produced pods, and produce seeds free from lygus seed 'sting' damage. Unfortunately, lygus pressure was very low this season on the Station and consequently, it was not possible to differentiate levels of resistance.

Description of 'California Blackeye No. 27'

'California Blackeye No. 27' (CB27) was developed by the University of California, Riverside (UCR) and released by the California Experiment Station in 1999. CB27 is an erect, compact blackeye that has heat tolerance and broad-based resistance to Fusarium wilt and root-knot nematodes. CB27 was evaluated in performance trials conducted in California from 1994-1998 under the designation H8-8-27.

CB46, CB88 and CB5 carry the nematode resistance gene *Rk* that confers strong resistance to common strains of *Meloidogyne incognita* root-knot nematode. CB27 carries gene *Rk* and another recessive gene that act together in an additive fashion to provide greater protection against *Rk*-virulent forms of *M. incognita* and *M. javanica* root-knot nematodes. Reproduction and root-galling on CB27 caused by *Rk*-virulent *M. incognita* and *M. javanica* are about half those observed on CB46 and CB88.

CB27 has resistance to both Race 3 and Race 4 of Fusarium wilt, while CB46 and CB88 only have resistance to Race 3 of this disease. CB5 is susceptible to both Race 3 and Race 4. Race 3 is the predominant race of Fusarium wilt in California. Additional fields with Race 4 were identified in 1997 and 1998, suggesting that this race may be wide-spread.

CB27 has out-performed CB46 and CB88 in trials conducted in Stanislaus, Co. in 1995 and 1996 where Fusarium wilt Race 4 and gene *Rk*-virulent *M. incognita* root-knot nematodes were present. The average yield of CB27 was 2280 lb/ac, while CB46 yielded 1870 lb/ac, and CB88 yielded 1090 lb/ac.

In fields free from Race 4 Fusarium wilt and *Rk*-virulent root-knot nematodes, CB27 and CB46 had similar average grain yields (3870 and 3880 lb/ac, respectively) over sixteen replicated yield trials that were conducted at several sites in the San Joaquin Valley from 1995-1998. These trials were conducted on raised beds with furrow irrigation using row spacing and management systems typical of commercial fields in the San Joaquin Valley. Due to its compact growth habit, CB27 performs well on double-row 40" raised bed systems, and single-row 30" raised bed systems, but is less well suited for single-row 40" raised bed systems. CB27 has produced greater yields than CB46 in hot conditions that often occur in the southern San Joaquin Valley.

Foliage characteristics of CB27 are similar to CB5, CB46 and CB88. For example, it has white flowers, red pigmentation at the stem and branch nodes and similar foliage color, leaf size and shape. With a May sowing date and typical growing conditions in the San Joaquin Valley, CB27 begins flowering in about 52 days and matures its first flush of pods in about 95 days from sowing. CB27 has an erect 'bush' growth habit and is substantially more compact than CB5 and CB88, and slightly more compact than CB46.

CB27 has a brighter white seed coat than CB46. The seed shape is similar to CB5, slightly flatter and less round than CB46. The 100-seed weight of CB27 was 22.4 g compared to 21.7 g for CB46 over eleven replicated field trials conducted in the San Joaquin Valley from 1995-1998. The black pigmented portion or 'eye' on the seedcoat does not 'leak' dark pigments during canning or cooking. Canning tests by S&W Foods, Modesto, CA and Michigan State University of grain grown in two California locations in 1996 and 1997 indicated this line has excellent canning quality.

Foundation Seed is being produced and will be available for production of Certified Seed in 2000. Consequently, Certified Seed of CB27 will be available to growers in 2001.

Table 1. Main Features of CB46 and UCR Entries in the 1999 Uniform Trial

Entry	Resistance to:							Seed weight in 1998 g/100
	Fusarium wilt		Root-knot nematodes			Heat	Cut-out	
	Race 3	Race 4	<i>M. incognita</i>					
			avirul.	virulent	<i>M. javanica</i>			
CB27	Yes	Yes	Yes	Yes	Yes	Yes	No	23
CB46	Yes	No	Yes	No	No	No	No	23
UCR 9802	Yes	Yes	Yes	No	No	No	No	23
UCR 9803	Yes	Yes	Yes	No	No	No	No	23
UCR 24-5	Yes	Yes	Yes	No	No	Yes	Yes	25
UCR 123	Yes	Yes	No	No	No	Yes	Yes	25

avirul. = avirulent, effectively controlled by gene *Rk*.
virulent = not effectively controlled by gene *Rk* alone.

Table 2. 1998 Uniform Trial Grain Yields of the Top Yielders

	Shafter	Tulare	Kearney	Riverside	Mean
	-----lb/ac-----				
CB27	5156	4967	4629	3113	4466
UCD 9259	5028	5208	4286	2861	4337
UCD 9823	3962	5388	5485	2447	4309
UCR 24	4442	5300	4601	2856	4289
UCD 9813	4994	5604	3837	2743	4278
CB 46	4732	5178	4268	2938	4271
UCD 9810	4420	5351	4007	3040	4191
UCR 9802	4468	5211	4383	2745	4190
UCR 123	4613	4823	4371	2960	4188
UCR 9803	4021	5428	4376	2862	4155
Mean	4496	5200	4330	2768	4186
LSD (0.05)	521	478	806	529	295
CV(%)	8	6	13	13	10
Planted-Cut*	5/22-10/1	6/5-10/16	5/21-10/2	6/5-10/2	

*Planting and cutting dates in 1998.