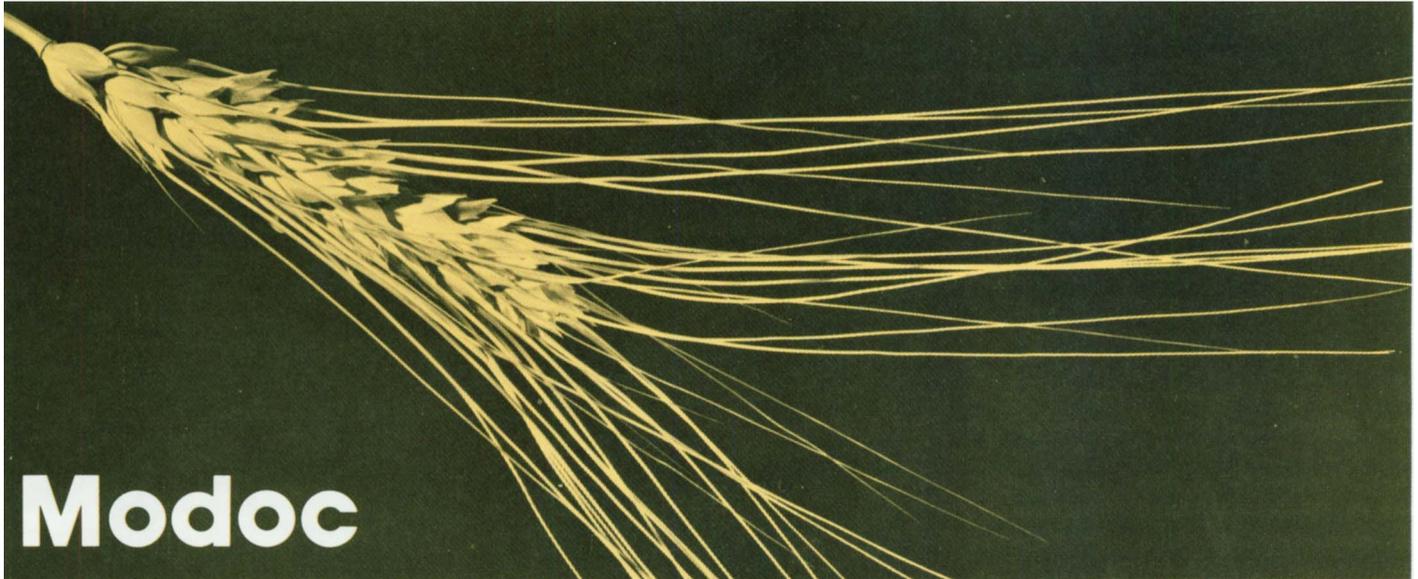


Modoc, a high-yielding, short-statured durum variety developed for the Tulelake area, produces grain of good quality for milling.



a new durum wheat for northern California

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Durum wheat, an important crop in northern California's Tulelake Basin since 1953, is planted in the spring in fertile, irrigated soil. The varieties used (developed by the U.S. Department of Agriculture and North Dakota State University) usually produce an average of 3,600 pounds per acre with good semolina quality. However, these varieties are susceptible to lodging, because they grow too tall in irrigated, highly fertile soil.

A search for short-statured durums was begun in the 1960s. Short-statured varieties tested so far, such as Oviachic 65 from Mexico and new varieties from the International Maize and Wheat Improvement Center (CIMMYT), have proved unsuitable.

In 1966 a local durum breeding program was started, emphasizing variety development for the Tulelake region but also working on varieties for the Sacramento-San Joaquin Delta region and other potential durum-producing areas of California. Plantings have been made each year since then in the Imperial Valley, Davis, the Delta, and Tulelake. Modoc—the first variety developed—was released by the University of California in 1975.

Modoc, originated from hybrid UC69494, is D7069 x Leeds made at Davis in 1969. The parent D7069 is a short-statured line from CIMMYT (II 22234-6M-1Y-OM = TremezMolle x Tehucan²) x (Zenati Bouteille x W²). The other parent, Leeds, is a tall variety with good semolina quality.

Description

Modoc has a spring growth habit, maturing at about the same time as Leeds at Tulelake and about two weeks earlier in the Imperial Valley. The variety is relatively photoperiod insensitive. The spikes

are fully awned; awns are about twice as long as the spike. The spike has white, glabrous glumes; the spikelets are moderately to densely arranged; and the peduncle is S-shaped (see photo). The grain is hard amber with good test weight and kernel size distribution.

The variety is short statured—about 38 cm shorter than Leeds or Sentry. Average height is about 90 cm; less than 0.1 percent of the plants are 2 to 5 cm taller than the remainder of the population. Modoc is stiff strawed, is lodging and shatter resistant, and, because of strong glumes, may be more difficult to harvest (combine) than present wheat and barley varieties. Modoc is susceptible to current races of stripe rust and powdery mildew.

Performance

Although yield data are limited to two years, Modoc outperformed Leeds and Sentry by 20 percent or more in all experiments (table 1). Modoc was evaluated in comparative performance trials at Tulelake, Imperial Valley, and the Sacramento-San Joaquin Delta in

TABLE 1. PERFORMANCE OF MODOC COMPARED WITH DURUM AND COMMON WHEAT VARIETIES IN U.C. REGIONAL AND FIELD STATION TRIALS, 1974 AND 1975

Variety	Number of experiments	Times exceeded by Modoc	Yield percent of Modoc
Leeds	7	7	72
Sentry	4	4	63
Anza	7	3	106
Lark (WS 1651)	4	2	93
Cocorit 71	3	1	105
Crane "B"	3	0	107
Produra	1	1	94

1974 and 1975 (table 2). In Tulelake tests, Modoc yielded about 40 percent more than Leeds and the same as or slightly less than the common wheat, Anza. Modoc yielded better than Leeds in the Imperial Valley and in the Delta.

Milling quality of grain produced from the field-scale plantings and from small-plot yield trials was evaluated with small-sample laboratory analyses by the USDA Durum Wheat Quality Laboratory at Fargo, North Dakota, and by General Mills, Inc., Great Falls, Montana (tables 3 and 4). Results indicate that Modoc has very good promise for use in pasta products.

Modoc was selected for the Tulelake Basin, where its susceptibility to stripe rust and powdery mildew has not influenced its performance. However, Modoc should be used with caution in the areas where stripe rust and powdery mildew are problems. Performance data in the Delta and the Imperial Valley suggest that the variety may be suitable there, but additional data are needed.

Initial distribution of foundation seed will be made from the 1975 Tulelake production, and new foundation seed will be developed from a 1975 breeders seed lot produced at Tulelake. Foundation, registered, and certified seed classes will be recognized for the variety. Breeders and foundation stocks will be maintained by the Foundation Seed and Plant Materials Service, Department of Agronomy and Range Science, University of California, Davis.

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TABLE 2. YIELDS OF DURUM VARIETIES AT THREE CALIFORNIA LOCATIONS

Variety	Tulelake						Delta		Imperial Valley	
	1974*	1975			Mean (1974-75)	Percent of Leeds	1975	Percent of Leeds	1975	Percent of Leeds
		Test 1	Test 2	Test 3 (557)						
Modoc (TLD 701W)	5,740	6,540	8,340	6,910	6,880	141	5,750	120	7,110	150
Sentry	4,520	4,480	3,840	---	---	---	---	---	3,610	77
Leeds	4,900	5,320	3,570	5,720	4,880	100	4,770	100	4,710	100
Anza	7,090	6,270	8,280	7,080	7,180	147	6,520	137	---	---
Lark (WS 1651)	7,260	---	4,850	---	---	---	---	---	---	---
Cocorit 71	---	---	---	7,560	---	---	5,730	120	7,370	157
Crane "B"	---	---	---	7,370	---	---	6,040	127	7,750	165
Produra	---	---	---	---	---	---	---	---	6,660	141
Least Significant Difference—5%	880	1,090	1,190	1,430	---	---	1,070	---	1,030	---
Coefficient of Variation (%)	10.0	11.0	13.0	10.0	---	---	7.0	---	12.0	---

* 1974 results obtained with the bulk population containing both bronze and white glumes or with closely related sister lines.

TABLE 3. MILLING QUALITY EVALUATIONS CONDUCTED BY USDA DURUM WHEAT QUALITY LABORATORY, FARGO, NORTH DAKOTA, ON DURUM WHEAT GROWN AT TWO CALIFORNIA LOCATIONS

Location and year	Variety	Test weight lb/bu	Weight of 1,000 kernels gm	Kernel size %		Wheat protein %	Purified semolina %	Yellow pigmentation		General evaluation
				large	medium			Dust color score	Visible color*	
Tulelake	Modoc†	63.5	46.9	75	23	13.4	48.6	91	9.5	Good promise
1971	Leeds	65.0	43.9	63	35	11.4	52.5	90	9.5	Good promise
1971	Sentry	62.0	49.3	70	28	14.4	47.7	89	9.0	Good promise
Imperial Valley	Modoc‡	65.0	45.7	67	32	12.4	59.8	94	10.0	Good promise
1973	N.D. Standard Blend	61.9	38.0	36	61	12.6	51.4	95	9.5	Good promise

* Scale of 0 to 10.

† F₃ generation (UC69494-43T-262T) obtained in breeding program.

‡ Line (TLD701 bulk) developed in breeding program and selected line.

TABLE 4. MILLING QUALITY EVALUATION CONDUCTED BY GENERAL MILLS, INC., GREAT FALLS, MONTANA, ON DURUM WHEAT VARIETIES GROWN AT FOUR CALIFORNIA LOCATIONS

Location and year	Variety	Test weight lb/bu	Protein %	Kernel distribution %		Weight of 1,000 kernels gm	Flour extraction %	Ash %	Flour protein %	Dust color score	Vitreous kernel %
				large	medium						
Tulelake (TFS)	Modoc*	62.4	13.7	—	—	44.3	61.0	0.78	12.3	98	—
1972	Leeds	60.2	15.3	—	—	49.2	62.0	.81	14.3	97	—
1974	Modoc†	63.5	13.4	91	9	43.9	61.2	.68	11.5	94	—
1974	Leeds	63.5	14.8	93	7	43.2	62.4	.69	12.8	96	—
1974	Sentry	62.2	15.8	92	8	41.7	58.4	.69	13.7	94	—
1975	Modoc†	66.0	12.1	95	5	49.1	62.3	.81	11.0	92	—
1975	Leeds	64.6	12.3	97	3	46.8	64.5	.80	11.0	92	—
Christy Farm, Tulelake Basin	Modoc‡	61.1	13.7	88	12	43.3	58.8	.77	11.4	90	—
1974	Leeds	60.1	13.8	72	28	38.3	60.3	.73	11.6	91	—
Kandra Farm, Tulelake Basin	Modoc‡	63.8	15.2	95	5	44.9	63.0	.71	13.2	90	—
Imperial Valley	Modoc‡	64.2	13.5	90	10	46.0	58.0	.76	11.2	92	98
1975	Modoc†	66.1	12.2	90	10	46.0	—	.70	10.9	98	98
1975	Leeds	62.8	11.8	60	38	36.0	—	.71	10.8	100	87
1975	Sentry	62.0	11.6	65	33	36.0	—	.74	11.0	98	92
1975	Cocorit 75	62.0	11.9	85	14	44.0	—	.71	10.6	87	94
1975	Produra	64.5	11.8	88	11	44.0	—	.68	10.5	90	97
1975	Crane "s"	62.0	12.4	89	11	47.0	—	.69	10.4	89	95

* F₄ generation (UC69494-43T-252T-768T) obtained in breeding program.

† Line (TLD701W) developed in breeding program and selected pure line for spike color.

‡ Line (TLD701 bulk) developed in breeding program and selected line.