

Raised Bed Alfalfa Varietal Production in La Paz County 1993-1994

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Abstract

Twenty alfalfa varieties grown in small plots on raised beds were evaluated for forage production beginning in 1993 after planting in the fall of 1992. Data from four harvests, generally covering the summer months, were obtained annually. No variety produced more forage than CUF 101 in both 1993 and 1994, but the varieties Tillman and Moapa had higher total production during the two year period. The varieties Rio and WL 516 had least amounts of forage production over the two year period, primarily due to low production in 1993. Percentage bloom and plant height were very highly correlated from the July 1993 harvest. Total forage production from 1993-1994 may be correlated to the bloom and height measurements taken in July 1993, as Tillman, Moapa and CUF 101 had the highest percentage bloom, while Rio and WL 516 had the least bloom. Cibola and CW 2981 had greater than 240,000 crowns per acre following the 1994 season, followed by Tillman and Condor; WL 516, Madera, and ABI 9182 each had fewer than 180,000 crowns per acre.

Introduction

Alfalfa is grown on approximately 40,000 acres in La Paz County. A significant amount of alfalfa in the southern half of Parker Valley is produced utilizing raised beds due to heavier soils which have lower water infiltration rates and may lead to scalding of alfalfa plants during summer irrigations if basin irrigation were to be used. Growers comment that stand life on beds is longer and production is higher. Varieties have not been examined locally utilizing bedded production and with the numbers of alfalfa varieties increasing, the need exists for information on alfalfa varieties suited for beds.

This study is a three year examination of various alfalfa varieties, with data from the first two years currently available. The two years of the study have been quite different in climate as 1993 was characterized as being fairly cool for the Parker area, while 1994 was noted for very hot, record breaking summer temperatures (late June was above 125°F), providing some extreme conditions for optimum alfalfa production. Further production information will be obtained during the third year of the study (1995).

Materials and Methods

Twenty alfalfa varieties, including several previously locally untested varieties, were planted on October 27th, 1992 on raised beds in cooperation with Quail Mesa Farms (Jim Lloyd, Manager), located approximately 12 miles north of Ehrenburg, AZ. CUF 101 was selected as the industry standard for comparison with the other 19 varieties. Varieties were broadcast planted at a rate of 15 lbs of seed/acre. Beds were on 40 inch centers. Plot sizes were 15 ft long by 2 beds wide (6.5 ft). Each variety was replicated four times in a randomized complete block design.

Yield data were collected for a minimum of four harvests for each year, usually during the summer. This consisted of collecting a subsample from each plot area by placing a square wooden frame (19.75", internal area = 2.71 square feet) in each plot, hand harvesting the alfalfa inside the square, and placing harvested alfalfa in paper bags. Bagged alfalfa was then oven dried, weighed, and net alfalfa weights were calculated.

Harvest samples were collected July 13, August 9, and September 2 and 28 during 1993, and May 10, June 13, July 12, and November 29 during 1994. Harvest data were collected from all four replicates on July 13, 1993, and May 10, 1994. All other harvest data were collected from only two replicates.

Plant height measurements were obtained on July 7, 1993. Four plants/plot were measured for height and percent bloom was recorded.

Crown counts were taken at the end of the second growing year on December 11, 1994. The square wooden frame used for harvest was placed on a bed, and crowns were counted and recorded. Each plot was sampled once. All data with four replications were analyzed using analysis of variation and S-N-K tests (Co-Stat 2.0)

Results

Forage Yields

Of 20 varieties in the trial, only three varieties had greater average yields in 1993 than CUF 101's 1.62 tons/acre. These varieties were Tillman (120.0% of CUF 101, Moapa (101.9%) and Cibola (100.9%). Only three varieties produced 90-100% of CUF 101 during 1993, these varieties being Madera (97.1%), Pioneer 5715 (93.2%), and Mecca (91.8%). A few varieties produced less than 80% of CUF 101. These varieties were WL 516 (74.4%), Rio (59.7%) and CW 2980 (76.2%). Data are shown in Table 1 and Figure 1.

During 1994, two varieties produced more than CUF 101's 1.86 tons/acre average harvest (Table 2, Figure 1). These varieties were Condor (102.7%) and CW 2979 (106.6%). Tillman, the highest yielding variety in 1993, produced 96.7% of CUF 101 during 1994. Three varieties produced less than 90% compared with CUF 101 (WL 516 - 82.7%; CW 2981 - 88.4%; and 13R Supreme 89.9%). Rio, the lowest yielding variety in 1993, yielded 92.6% of CUF 101. (Figure 2, Table 2).

No variety outyielded CUF 101 in both 1993 and 1994, although several varieties did so in either 1993 or 1994. Two varieties did outyield CUF 101 for the two year period, primarily due to the first year production. These varieties were Tillman (107.6% of CUF 101) and Moapa (100.7%). Varieties producing between 95-100% of CUF 101 were Madera (98.0%), Cibola (97.1%) Condor (95.8%) and CW 2979 (96.3%). Nine varieties yielded less than 90% of CUF 101. These varieties were WL 605 (89.5%), WL 516 (78.9%), Pioneer 5888 (85.7%), Sandor (87.0%), Rio (77.3%), 13R Supreme (89.8%), ABI 9182 (88.9%), CW 2980 (88.3), and CW 2981 (85.4%). All other varieties were between 90-95% of CUF 101 in forage production (Table 3, Figure 3).

Plant Height and Bloom

Significant statistical differences existed between varieties for both plant height and bloom, which were very highly correlated ($P \leq 8 \times 10^{-10}$). Two varieties (Rio and WL 516) were less than 57 cm tall while Tillman was over 73 cm in height. The two short varieties also had less than 1% bloom on the sample date while Tillman had 9.5% bloom, followed by Moapa at 6.5% and CUF 101 at 6.125% (Table 3).

Bloom may also indicate the long term forage production ability of these varieties, as bloom and plant height (the latter should correlate to forage production at any harvest when not considering leafiness) were very highly correlated for the July 1993 harvest. The three highest yielding varieties from 1993-1994 (Tillman, Moapa and CUF 101) also had the same respective order for percent bloom in July 1993. Conversely, the varieties with less than 0.5% bloom in July 1993 (WL 516 - 0.25%, Rio - 0.125%) were also the varieties with the least amounts of forage production over the two year period (WL 516 - 78.9% of CUF 101; Rio - 77.3%). (Figure 3)

Crown Counts/ Stand Persistence

Of the 20 varieties in the trial only two (Cibola and CW2981) had crown counts equivalent or greater than 240,000/acre at the end of the second growing season (Figure 4). Two varieties had crown counts between 220,000-240,000/acre (Tillman and Condor). Two varieties were between 160,000-180,000/acre (Madera, ABI9182) and only WL516 averaged fewer than 160,000 crowns/acre. All other varieties were between 18,000-22,000/acre. Cibola and CW2981 had statistically more crowns than only WL516.

TABLE 1. FIRST YEAR FORAGE PRODUCTION (1993) OF ALFALFA VARIETIES GROWN ON BEDS,
LA PAZ COUNTY, ARIZONA¹

VARIETY	HARVEST DATE ¹				TOTAL POUNDS FORAGE	PERCENTAGE OF CUF101
	JULY 7	AUG 9	SEPT 2	SEPT 28		
CUF101	4,207 ^a	3,550	2,663	2,556	12,976	100.0
WL 605	3,233 ^a	4,083	1,136	3,053	11,505	88.7
WL516	3,056 ^a	3,373	1,773	1,455	9,657	74.4
MECCA	4,207 ^a	3,479	2,485	1,738	11,909	91.8
MARICOPA	3,277 ^a	4,367	1,952	1,775	11,371	87.6
MADERA	3,543 ^a	4,367	1,242	3,444	12,596	97.1
MOAPA	4,030 ^a	3,728	2,307	3,160	13,225	101.9
PIONEER 5888	3,277 ^a	3,373	1,775	1,988	10,413	80.2
PIONEER 5715	3,366 ^a	3,373	1,952	3,408	12,099	93.2
CIBOLA	3,587 ^a	4,438	2,056	3,018	13,099	100.9
TILLMAN	4,562 ^a	4,260	2,663	4,083	15,568	120.0
SANDOR	3,455 ^a	2,769	2,023	2,307	10,554	81.3
CONDOR	3,632 ^a	3,439	2,663	1,668	11,402	87.9
RIO	2,790 ^a	2,482	1,347	1,134	7,753	59.7
13 R-SUPREME	3,765 ^a	3,651	1,418	2,800	11,634	89.7
ABI 9182	3,543 ^a	3,013	2,056	2,339	10,951	84.4
ABI 9194	3,720 ^a	3,120	2,233	2,552	11,625	89.6
CW 2980	3,012 ^a	3,439	1,347	2,091	9,889	76.2
CW 2981	3,499 ^a	3,191	1,773	2,162	10,625	81.9
CW 2979	3,720 ^a	3,439	2,588	1,701	11,448	88.2

¹Means in columns followed by the same letter are not significantly different at the $p \leq 0.05$ level using a S-N-K test (Co-Stat 2.0)

TABLE 2. SECOND YEAR FORAGE PRODUCTION (1994) OF ALFALFA VARIETIES GROWN ON BEDS,
LA PAZ COUNTY, ARIZONA

VARIETY	HARVEST DATE ¹				TOTAL POUNDS FORAGE	PERCENTAGE OF CUF101
	MAY 12	JUNE 13	JULY 12	NOV 29		
CUF101	2,923 ^a	5,049	3,720	3,189	14,881	100.0
WL 605	3,059 ^a	4,252	3,720	2,657	13,423	90.2
WL516	2,657 ^a	4,429	2,126	3,100	12,312	82.7
MECCA	3,499 ^a	4,517	3,012	2,834	13,862	93.2
MARICOPA	2,702 ^a	4,783	3,455	3,100	14,040	94.3
MADERA	2,923 ^a	5,137	3,366	3,277	14,704	98.8
MOAPA	2,879 ^a	5,758	3,809	2,392	14,837	99.7
PIONEER 5888	2,923 ^a	3,986	3,189	3,366	13,464	90.5
PIONEER 5715	3,189 ^a	4,163	3,455	2,923	13,730	92.3
CIBOLA	3,233 ^a	4,606	3,012	3,100	13,951	93.8
TILLMAN	2,967 ^a	4,606	3,720	3,100	14,394	96.7
SANDOR	3,233 ^a	3,632	2,746	4,075	13,685	92.0
CONDOR	3,145 ^a	5,315	4,163	2,657	15,280	102.7
RJO	2,967 ^a	5,226	3,100	2,480	13,774	92.6
13 R-SUPREME	3,189 ^a	4,517	3,277	2,392	13,375	89.9
ABI 9182	3,012 ^a	4,695	4,163	1,949	13,818	92.9
ABI 9194	3,012 ^a	4,783	3,455	2,834	14,084	94.6
CW 2980	3,366 ^a	6,023	2,303	3,012	14,704	98.8
CW 2981	2,967 ^a	4,429	3,012	2,746	13,154	88.4
CW 2979	3,056 ^a	5,226	4,163	2,923	15,368	103.3

¹Means in columns followed by the same letter are not significantly different at the $p \leq 0.05$ level using a S-N-K test (Co-Stat 2.0)

TABLE 3. PLANT HEIGHT AND BLOOM FROM JULY 7, 1993 AND PRODUCTION AND CROWN COUNTS FOLLOWING THE 1994 SEASON¹

VARIETY	HEIGHT (cm)	% BLOOM	1993 - 1994 FORAGE PRODUCTION		CROWNS/ ACRE
			POUNDS FORAGE/ACRE	PERCENTAGE OF CUF101	
CUF101	65.8 ^{ab}	6.1 ^{bcd}	27,857	100.0	189,007 ^{ab}
WL 605	64.0 ^{ab}	4.2 ^{abc}	24,928	89.5	180,964 ^{ab}
WL516	56.3 ^a	0.3 ^a	21,969	78.9	156,835 ^a
MECCA	65.6 ^{ab}	5.1 ^{abc}	25,771	92.5	197,049 ^{ab}
MARICOPA	62.1 ^{ab}	2.0 ^{abc}	25,411	91.2	209,114 ^{ab}
MADERA	64.2 ^{ab}	2.4 ^{abc}	27,300	98.0	172,921 ^{ab}
MOAPA	68.1 ^{ab}	6.5 ^{cd}	28,062	100.7	205,092 ^{ab}
PIONEER 5888	62.5 ^{ab}	4.0 ^{abc}	23,877	85.7	205,092 ^{ab}
PIONEER 5715	66.1 ^{ab}	4.3 ^{abc}	25,829	92.7	189,007 ^{ab}
CIBOLA	67.2 ^{ab}	4.0 ^{abc}	27,050	97.1	249,328 ^b
TILLMAN	73.7 ^b	9.5 ^d	29,962	107.6	237,264 ^{ab}
SANDOR	63.5 ^{ab}	4.6 ^{abc}	24,239	87.0	217,157 ^{ab}
CONDOR	66.1 ^{ab}	4.1 ^{abc}	26,682	95.8	221,178 ^{ab}
RIO	54.5 ^a	0.1 ^a	21,527	77.3	189,007 ^{ab}
13 R-SUPREME	61.0 ^{ab}	1.3 ^{ab}	25,009	89.8	180,964 ^{ab}
ABI 9182	62.9 ^{ab}	1.5 ^{abc}	24,769	88.9	172,921 ^{ab}
ABI 9194	60.5 ^{ab}	1.5 ^{abc}	25,709	92.3	213,135 ^{ab}
CW 2980	65.9 ^{ab}	3.1 ^{abc}	24,593	88.3	201,071 ^{ab}
CW 2981	67.9 ^{ab}	0.3 ^{abc}	23,779	85.4	249,328 ^b
CW 2979	64.4 ^{ab}	2.9 ^{abc}	26,816	96.3	180,964 ^{ab}

¹Means in columns followed by the same letter are not significantly different at the $p \leq 0.05$ level using a S-N-K test (Co-Stat 2.0)

1993 FORAGE PRODUCTION FROM ALFALFA VARIETY TRIAL ON BEDS, LA PAZ COUNTY

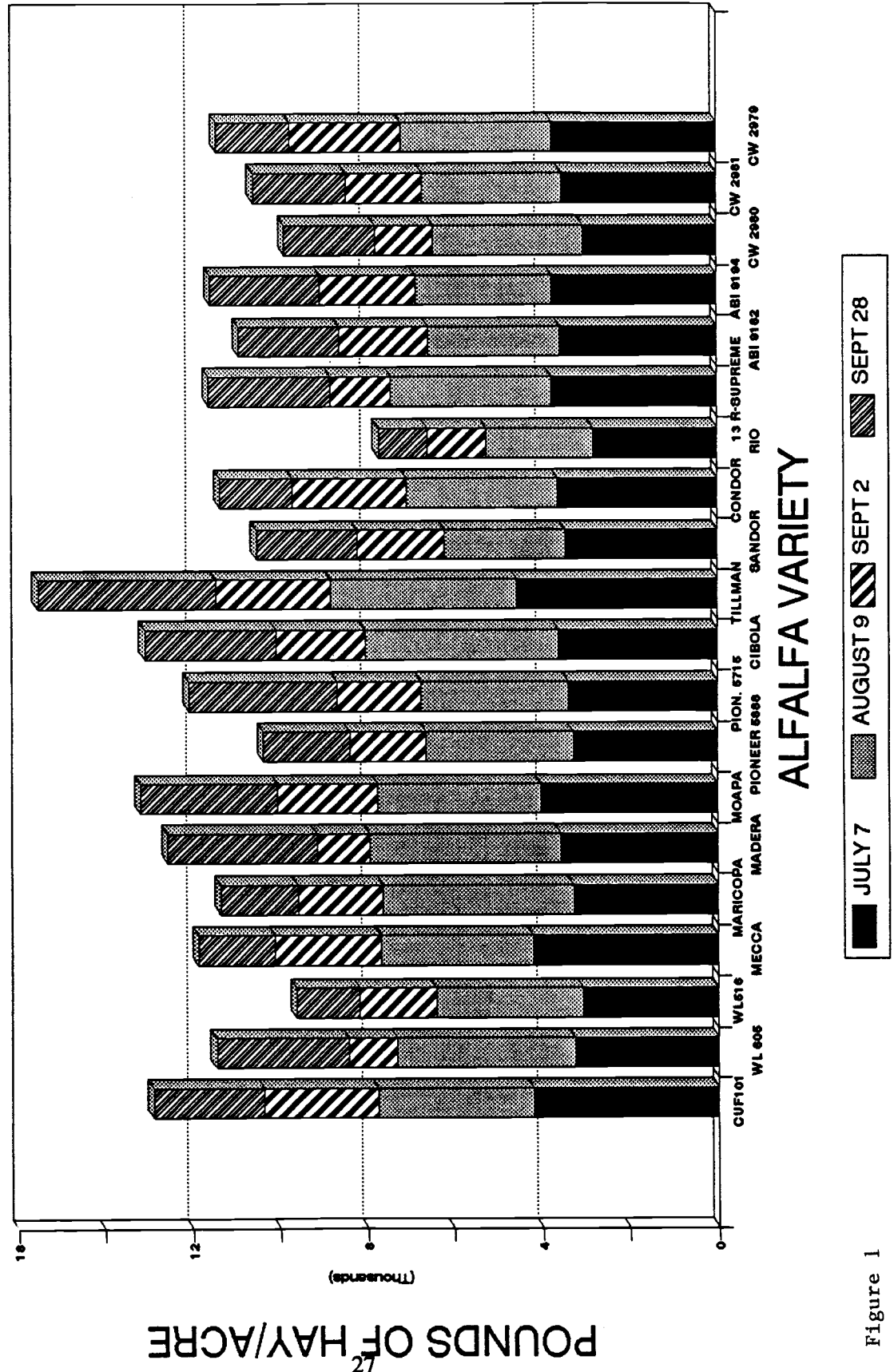


Figure 1

1994 FORAGE PRODUCTION FROM ALFALFA VARIETY TRIAL ON BEDS, LA PAZ COUNTY

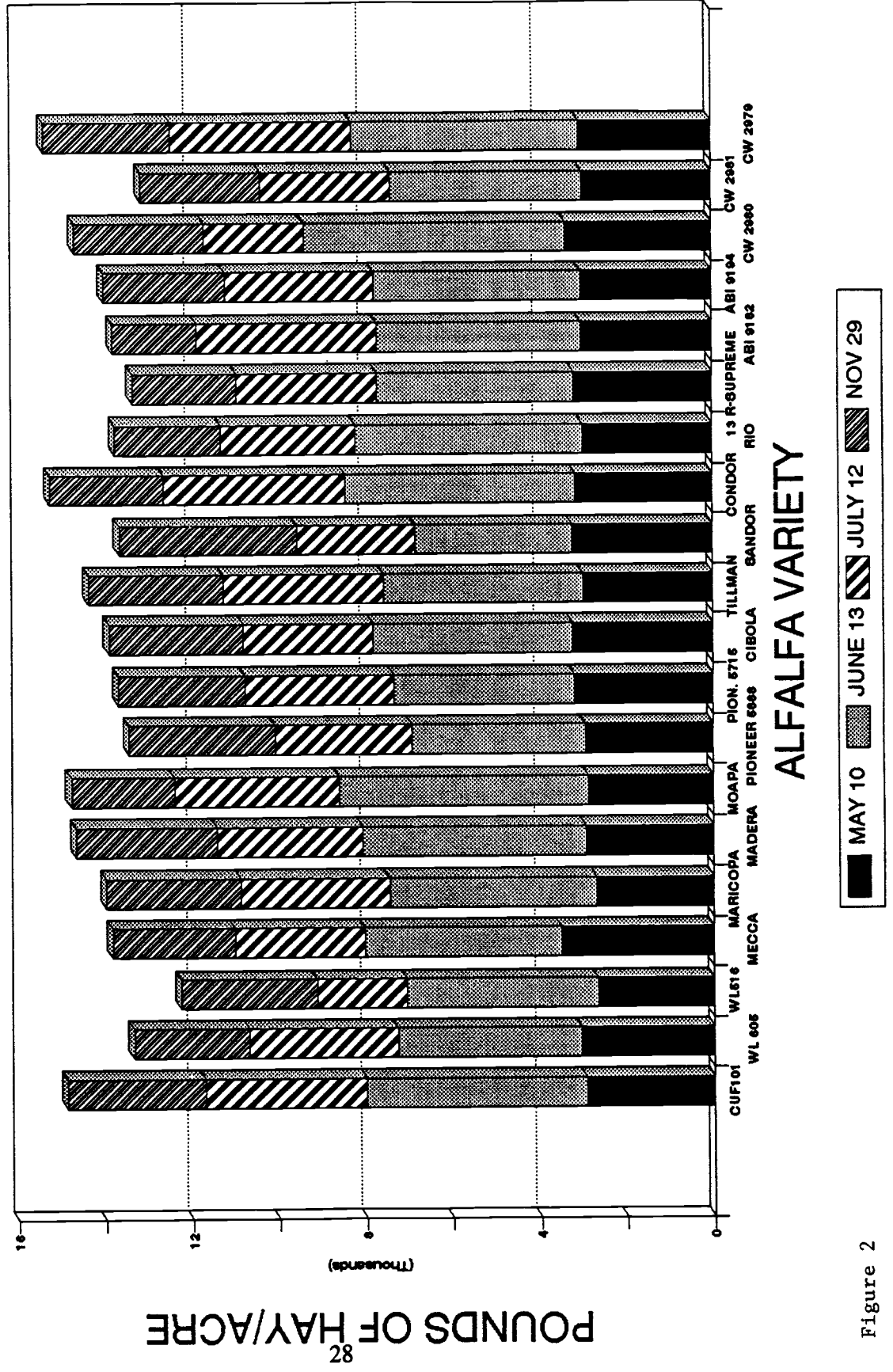


Figure 2

ALFALFA VARIETAL PRODUCTION FROM BEDS YIELD 93-94; BLOOM AND HEIGHT, JULY 93

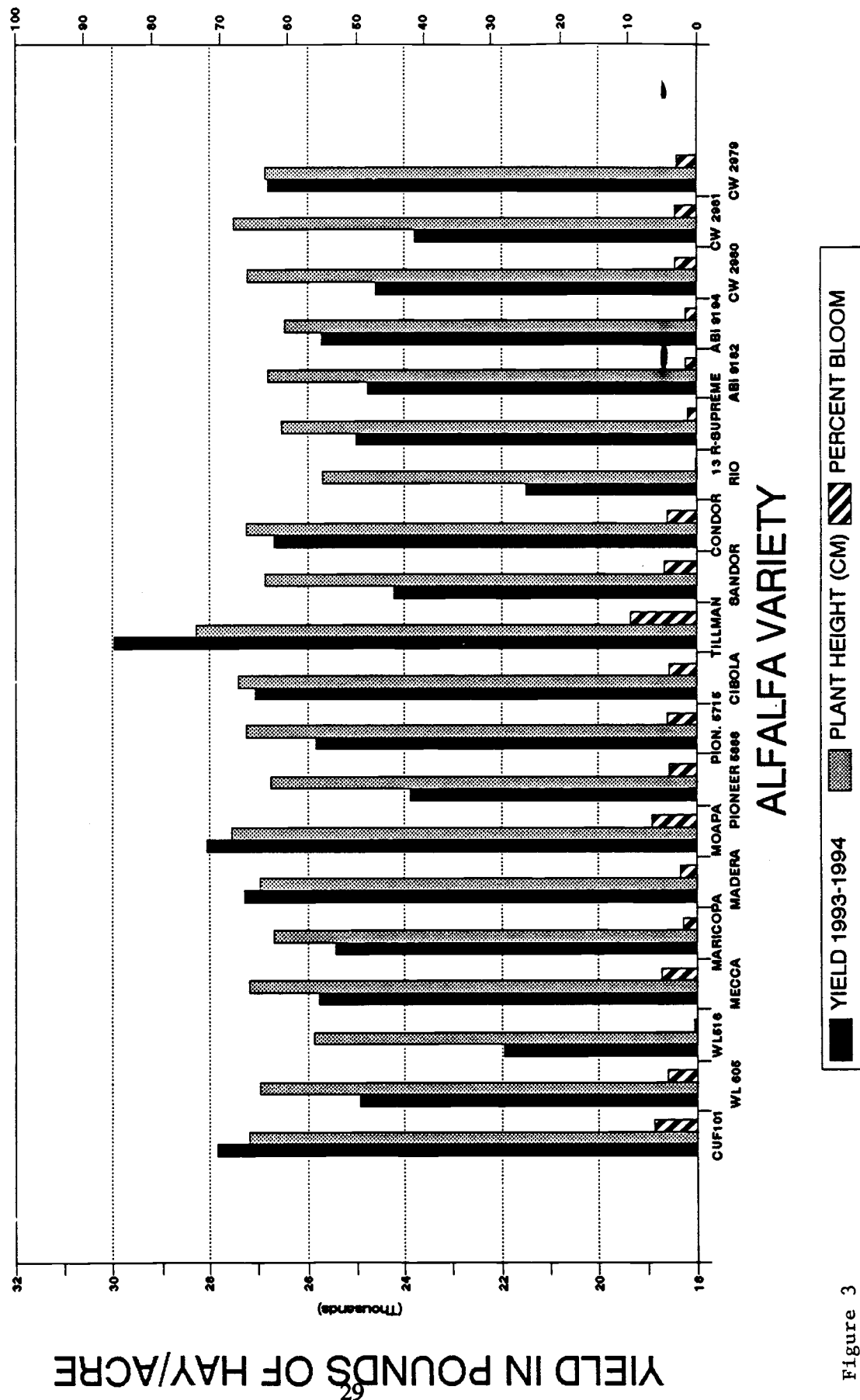
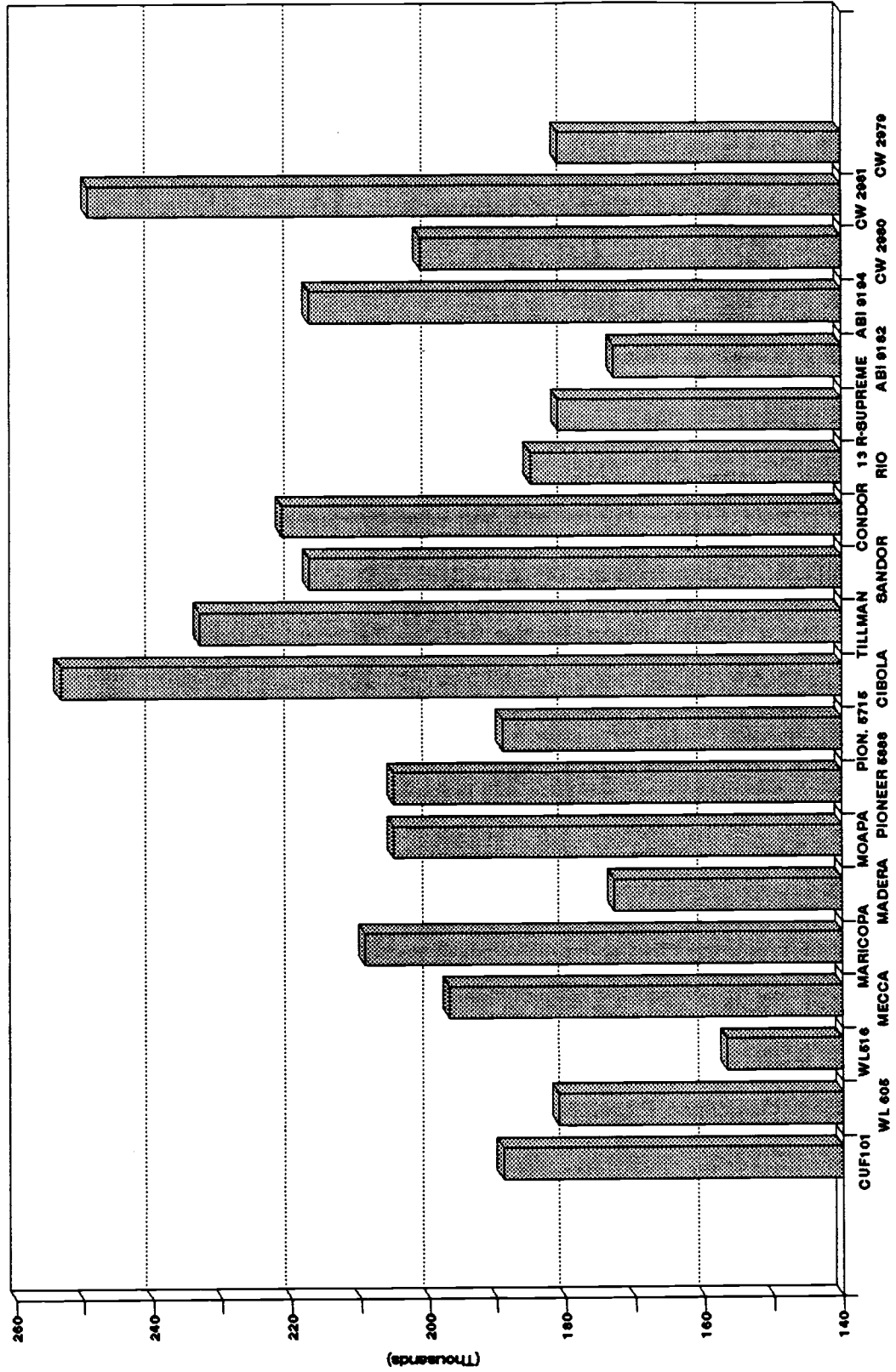


Figure 3

MEAN CROWNS/ACRE FROM BEDDED ALFALFA VARIETY TRIAL, DECEMBER 11, 1994



ALFALFA VARIETY

Figure 4