

Field Evaluation of Crisp-head Lettuce Varieties Grown in Southwest Low Desert Soils

Mohammed A. Zerkoune, Extension Agent, Yuma County Cooperative Extension, University of Arizona

Abstract

Crisp-head lettuce plays an important role in Yuma's economy. An estimated 51000 acres are cropped to large number of varieties each year with planting season that spreads from late August to March. Three demonstration sites and three planting dates were selected to compare new and existing varieties of head lettuce on growers' fields using standard farming practices. Selected growth parameters were evaluated throughout the growing season. Results indicate that varieties tested at JV Farms in Welton and at Yuma Agricultural Center (YAC) are expected to do well if grown under similar conditions and planting time. Some varieties tested during the second planting slot on Doug Melon Farm experienced some incidence of diseases. All three planting sites showed a significant head weight difference and two out of three planting sites showed a significant head diameter difference

Introduction

Crisp-head lettuce is the most economically important crop produced in Yuma County. In 1999 an estimated 51,000 acres of crisp-head lettuce were grown there, more than any other county in Arizona. Lettuce generates about \$300,000,000 for the Yuma economy. Yuma growers plant lettuce every day from late August through March.

The variety trial program described here was designed by the University of Arizona to assist growers and seed companies in evaluating newly released varieties and compare them to commercial varieties that are already available. Designed primarily for demonstration purposes, these trials were conducted in grower's fields using standard farming practices. Selected growth parameters were evaluated throughout the growing season. The specific objectives of this demonstration trial were to evaluate uniformity of stand and maturity of new and existing varieties of head lettuce.

Methods and Materials

Three locations and planting dates were selected. These were the J.V. Farm and the Doug Melon Farm in Welton, AZ, 30 miles east of Yuma, and the Yuma Valley Agricultural Center (YAC). We planted eight varieties on September 15, 1999 at the JV Farm and 12 varieties on October 1 at the Doug Melon Farm. Eight varieties were planted on October 15 at YAC. Fields were irrigated the day following planting at every location. Fields at three locations were planted on 40-inch bed, 50 feet long. They were arranged in a completely randomized block design with two replications. Varieties were direct seeded using an Earthway® push planter in double rows, planted with a north-south orientation. A commercial crew thinned all plots at 10-inch spacing.

Varieties had varying growth rates. Most growth parameters were evaluated on a scale from 1 to 5, with 1 as the least desirable. Some parameters were evaluated using different scales. These are explained in Tables 1a,

This is a part of The University of Arizona College of Agriculture 2000 Vegetable Report, index at <http://ag.arizona.edu/pubs/crops/az1177/>

1b and 1c. Parameters rated on the 1 to 5 scale were averaged to give the overall rating. Varieties with an overall rating of 4 and 5 are expected to grow well under similar conditions. Varieties with overall rating of 3 and below may experience problems. Head weight and head diameter measurements were made at maturity for each variety. Five heads per variety were harvested, trimmed and weighed individually as sub-samples to evaluate the head uniformity. Statistical analysis (SAS ver.7) was performed on head weight and head diameter. Table 2a shows the results of the analysis of variance (ANOVA). The choice of lettuce head weight and head diameter for analysis of variance is based on the current market standard that requires growers to pack 24 heads of lettuce in boxes that weigh 43-48 pound.

Results and Discussion

JV Farm

The grower's field was planted with Sun Devil (Genecorp Advanced Genetics, Seed Company) varieties. Varieties planted at JV Farm were harvested on December 4, 1999. In this first slot all varieties had an overall rating equal or superior to 4 (Table 1a), indicating that every variety tested is expected to grow well under similar conditions. Plant vigor and lack of disease also had high scores.

The ANOVA showed a significant head weight difference among varieties. The Raider variety had the highest head weight, while variety Sun Devil had the lowest. No significant difference was observed in head diameter.

All varieties tested also had an excellent field holding capability. Kahuna, GX166, and Diplomat varieties had a delayed maturity as compared to the rest of the other varieties (Table 1a).

Doug Melon Farm

Planting at the Doug Melon Farm took place on October 1, 1999. The grower's field was planted with Del Oro variety from Petoseed Company, Inc. Yuma, AZ. The harvest took place on January 18, 2000. Contrary to results from the JV Farm, we observed several cases of diseases (Table 1b). During this same time period growers in the area also experienced some incidences of disease. Table 1b shows results of our evaluations. The plant vigor for some varieties also had a low score.

Most varieties had an overall rating between 3 and 4, while Kahuna scored a 5. Tres Equis and Fortuna scored less than 3, which means that these varieties would not do well if grown under similar conditions and planting date.

Our ANOVA (Table 2b) showed that head weight and head diameter both were significantly different among varieties. PX7328 had highest head weight and diameter. Kahuna had the lowest head weight and diameter.

Yuma Agricultural Center

At YAC we used Del Oro variety as the grower standard. Field harvest took place on January 30, 2000. Varieties grown at YAC performed better in the overall rating than those grown at Doug Melon Farm (Table 2c). Among varieties tested, Fortuna and Del Oro did score very well in the overall rating of 5 each. Under similar conditions and planting date these varieties are expected to perform well.

We observed a significant head weight and head diameter difference among varieties tested at 10 % alpha level using Duncan Multiple Range. Pico Rico had the heaviest head and Tres Equis and Rico had the smallest. The variety PX7328 had the largest diameter while Tres Equis had the smallest diameter.

Table 1a. Data summary of observations collected on lettuce variety trial conducted at JV Farm, in 1999-2000.

Variety	Overall Evaluation (a)	Maturity (b)	Uniformity (a)	Color ©	Leaf Texture (d)	Size Diameter in	Weigh oz	Plant Frame (a)	Vigor (a)	Butt Appearance (e)	Field Holding (a)	Incidence of Disease (a)	Key: a) 5= the most desirable, 1 least desirable b) M= mature, O= over, U= under c) 5=dark, 4=bright, 3=dull, 2=light,1=yellow d) 5=Heavy, 1=light e) 5=smooth & round, 4 smooth & flat, 3=ribby, 2=sheep nose, 1= concave Comments
GX166 (Genecorp)	5	U	5	4	5	7	19.1	5	5	5	5	5	Not uniform, good size head, erect
Navigator (Genecorp)	4.7	M	4	4	4	6	21.0	4	5	5	5	4	Lack of good appearance, early maturity
Raider (Genecorp)	4.7	U	5	4	5	7	28.0	5	5	5	4	4	Good stand uniformity, nice green color
Mohak (Petoseed)	4.3	M	4	4	4	6	29.3	4	5	4	5	5	Lack of good stand uniformity, but good color
Diplomat (Petoseed)	4.8	U	5	4	5	7	26.7	4	5	5	5	5	Excellent uniformity, good appearance, nice green color
Kahuna (Synergene)	4.7	U	5	5	4	7	26.8	5	5	5	4	5	Somehow lack of good appearance
Fuente (Synergene)	4.9	M	5	4	4	7	28.8	5	5	5	5	5	Erect , not good appearance
Tres (Synergene)	4.8	U	4	4	4	7	28.6	4	4	5	5	5	Good stand and good color
Sun Devil (Prog.Adv Genetics)	4	U	5	4	4	5	12.4	4	5	4	5	5	Good stand , but somehow erect, good color overall

Table 1b. Data summary of observations collected on lettuce variety trial conducted at Doug Melon Farm in 1999-2000.

Variety	Overall Evaluation (a)	Maturity (b)	Uniformity (a)	Color ©	Leaf Texture (d)	Size Diameter in	Weigh lb, oz	Plant Frame (a)	Vigor (a)	Butt Appearance (e)	Butt Size (e)	Field Holding (a)	Incidence of Disease (a)	Key: a) 5= the most desirable, 1 least desirable b) M= mature, O= over, U= under c) 5=dark, 4=bright, 3=dull, 2=light,1=yellow d) 5=Heavy, 1=light e) 5=smooth & round, 4 smooth & flat, 3=ribby, 2=sheep nose, 1= concave Comments
Kahuna (Synergene)	2.4	M	5	3	4	5	433	3	3	†	†	2	2	Fairly good leaf texture, but presence of diseases
Pico Rico (Synergene)	3.7	M	4	5	5	5.9	707	4	5			5	5	Nice green color
Del Oro	3.7	M	4	5	5	6	672	4	5			4	4	Nice green color but luck of uniformity, not firm
PX7328	3.6	M	5	4	5	6.6	812	4	4			4	4	Dark color, nice look and firm.
Rico (Synergene)	3.8	M	5	5	5	6.2	682	4	5			5	5	Nice color
Tres Equis (Synergene)	2.4	M	5	3	4	5.8	692	3	2			4	4	Presence of diseases, wilted leaves,
Fortuna (Synergene)	2.4	M	5	3	4	5.4	530	3	2			2		Presence of diseases, wilted leaves,
Fuente (Synergene)	3.8	M	5	5	5	5.6	606	4	5			5	5	Good looking, good field holding
SSC30375 (Shamrock)	3.2	M	4	4	5	6.3	760	4	4			5	4	Spotted leaves with diseases, not good color
SSC30376 (Shamrock)	3.2	M	4	4	5	5.5	676	4	4			2	2	Severe cases of diseases
SSC303423 (Shamrock)	3.7	M	5	5	5	6.0	602	5	5			4	5	Good field holding, no disease, good leaf texture
Yucaipa (Shamrock)	3.7	M	5	5	5	5.6	586	5	5			4	3	Spotted leaves with diseases

† These characteristics were not evaluated

Table 1c. Data summary of observations collected on lettuce variety trial conducted at Yuma Agricultural Center 1999-2000

	Overall Evaluation (a)	Maturity (b)	Uniformity (a)	Color C	Leaf Texture (d)	Size Diameter in	Weight (grams)	Plant Frame (a)	Vigor (a)	Butt Appearance (e)	Butt Size (f)	Field Holding (a)	Incidence of Disease (a)	Evaluation Date	Key: a) 5= the most desirable, 1 least desirable b) M= mature, O= over, U= under c) 5=dark, 4=bright, 3=dull, 2=light, 1=yellow d) 5=Heavy, 1=light e) 5=smooth & round, 4 smooth & flat, 3=ribby, 2=sheep nose, 1= concave Comments
Kahuna	4	O	4	4	5	5.5	775	4	4	4	4	4	4	12/5	lack of uniformity, and head size,
Pico Rico	4	M	4	4	4	5.2	850	4	4	4	5	5	5	12/9	Excellent stand uniformity, good vigor, erect
Del Oro	5	M	5	5	5	5.35	835	4	5	3	6	5	5		not good appearance, good vigor
PX7328	4	O	4	2	5	5.6	741	4	4	4	5	4	3	12/5	Uniform and good appearance
Rico	5	M	5	5	5	4.85	645	5	5	5	6	5	5	12/9	Excellent, uniformity and good appearance
Tres Equis	4	O	4	4	5	4.8	640	5	4	5	5	4	4	12/9	Somehow uniform and appearance, but lack of uniformity
Fortuna	4	O	4	2	4	5.05	705	4	4	3	4	4	5	12/5	Not uniform, erect
Fuente	5	M	5	5	5	5.4	810	4	5	4	5	5	5	12/9	Good stand and vigor, overall good

Table 2a. Analysis of variance for head weight and head diameter of lettuce varieties grown at JV farm in 1999-2000

Source of variation	DF	Head weigh	Head diameter
		Pr.>F	Pr.>F
Rep	1	0.132	0.779
Variety	7	0.030	0.280
R2		0.76	0.42
CV		16.8	10.44
Mean Comparison			
Varieties		Head weight (gram)	Head diameter (in)
Raider		790a [†]	6.5a
Tres Equis		686ab	6.25a
Diplomat		6663abc	6.25a
Mohak		661abc	6.20a
Kahuna		659bc	6.75a
Navigator		556dc	6.20a
GX166		508dc	6.50a
Fuente		469dc	6.25a
Sun Devil		442d	5.50a

[†] Means followed by same letters are not significantly different at 10% alpha level

Table 2b. Analysis of variance for head weight and head diameter of lettuce varieties grown at Doug Melon Farm in 1999-2000.

Source of variation	DF	Head weight	Head diameter
		Pr.>F	Pr.>F
Rep	1	0.521	0.728
Variety	11	<0.001	0.003
Variety*sample	48	0.959	0.965
R2		0.58	0.52
CV		22.5	13.6
Mean comparison			
Variety		Head weight (gram)	Head diameter (in.)
PX7328		812a [†]	6.6a
SSC30375		760ab	6.3ab
Pico Rico		707abc	5.9bcd
Tres Equis		692abc	5.8bcd
Rico		682bc	6.2abc
SSC30376		676bc	5.5 cde
Del Oro		672bc	6.0abcd
Fuente		606dc	5.6cde
SSC303423		602dc	6.0abcd
Yucaipa		586dc	5.6cde
Fortuna		530d	5.4de
Kahuna		453e	5.0e

[†] Means followed by same letters are not significantly different at 10% alpha level

Table 2c Analysis of variance for head weight and head diameter of lettuce varieties grown at Yuma Valley Research Center in 1999.

Source of variation	DF	Head weight	Head diameter
		Pr.>F	Pr.>F
Rep	1	0.0001	0.0001
Variety	7	0.056	0.023
Variety-sample	32	0.5581	0.0146
R2		0.62	0.57
CV		12.1	20.1
Mean Comparison			
Varieties		Head weight (gram)	Head diameter (in)
Pico Rico		850a [†]	5.20abcd
Del Oro		835a	5.35abc
Fuente		810ab	5.40ab
Kahuna		775ab	5.50ab
PX7328		741abc	5.60a
Fortuna		705bc	5.05bdc
Rico		645c	4.85c
Tres Equis		640c	4.80d

[†] Means followed by same letters are not significantly different at 10% alpha level