

# Field Evaluation of Broccoli Varieties Grown in Southwest Low Desert Soils

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## Abstract

*Based on the acreage, broccoli is the third largest vegetable crop in Yuma County, after head lettuce and romaine. It generates over 36 million dollars to Yuma's economy. Efforts are continuously made by growers, seed industry and the University of Arizona outreach program to produce better crops that respond to consumer's choice. Selection of newly adapted varieties is made based on agronomic performance as well as commercial value. Stand uniformity disease resistance, vigor, head shape and head size are among characteristics that are evaluated. The objective of this demonstration trial is to evaluate the performance of newly developed varieties grown under standard cultural practices and to provide unbiased observations to growers and the seed industry. Fourteen varieties were tested on growers' fields in Yuma County. No incidence of disease was observed among varieties tested and the overall evaluation rating was greater than 4 indicating that most of varieties tested will grow well under similar growing conditions and planting date. Significant head diameter and plant height was observed among varieties evaluated.*

## Introduction

Yuma's producers grow close to 8000 acres of broccoli every year that generates more than 36 millions dollars to the county's economy. Continuous efforts are made by seed industry and growers to improve the performance of broccoli crops. The University of Arizona outreach program at Yuma County designs, conducts variety trials, and performs an independent evaluation. We also disseminate independent information to growers and related businesses

Selected varieties and crop management practices are the main factors that contribute to grow profitable broccoli crops. Varieties are selected for agronomic performance and commercial values. On the field, desirable agronomic qualities of broccoli crop include uniform maturity and uniform size with good holding capability and acceptable disease resistance. Market values include color and uniformity, with dome shaped head and dense with blue to blue green color. A good height is also a desirable characteristic.

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This is a part of the University of Arizona College of Agriculture 2001 Vegetable Report, index at: <http://ag.arizona.edu/pubs/crop/az1252/>

Uniform maturity is a characteristic of interest to growers. Crops with a grouped maturity allow harvest to be done at once. Head size uniformity is good for packaging purposes. It is desirable to pack a consistent number of broccoli heads per box. Other characteristics such as field holding capability, disease resistance and color are also evaluated. The objectives of this demonstration trial are to evaluate broccoli varieties submitted by seed companies, and to allow seed companies and growers to perform their own evaluation either during an organized field day or during an individual field visit.

## **Methods and Materials**

Sakata, Bejo , Petoseed and Rogers seed companies participated in the University of Arizona 2000-01 broccoli variety trial. Barkley Farm was the selected site to conduct this demonstration trial. We planted fourteen varieties including Everest as a field variety in a completely randomized block design with two replications in this demonstration trial. All varieties were direct seeded, about 5-inch spacing. We used Earthway hand push planter to plant the fourteen varieties in two-row bed at 42 inch spacing and 50 foot long in north-south orientation on October 8, 2000. Wet day was set for October 10, 2000 with sprinkler irrigation to initiate germination followed by furrow irrigation throughout the growing season. Standard cultural and IPM practices were utilized throughout the growing season. A commercial crew thinned all plots at approximately 10-inch spacing.

All varieties had various growth rate. Plant characteristics were evaluated over a period of time during the growing season. Most growth parameters were evaluated on 1 to 5 scale with 1 as the least desirable and 5 as the most desirable. Parameters evaluated otherwise have their key shown on the upper right of Table 1. Parameters rated on 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 some problems. Five heads per variety were measured for head diameter, and plant height as sub-samples to evaluate the head's uniformity and subject to the analysis of variance using SAS version 8.

## **Results and Discussion**

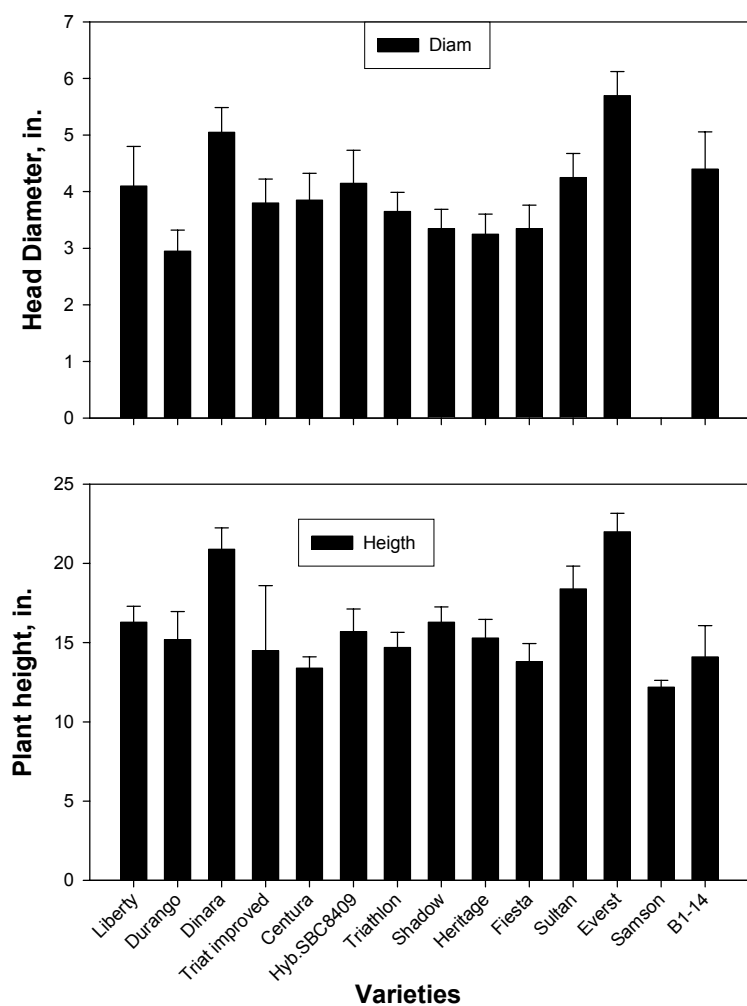
Results of field evaluations are reported in Table 1 and the analysis of variance is shown on Table 2. The mean comparison is shown in Figure 1. The overall rating for all varieties is greater than four indicating that all varieties tested will do well under similar growing conditions, except Samson variety that did not reach maturity at the time field variety was harvested on January 24 through January 30, 2001. No incidence of disease was observed among varieties tested. Broccoli varieties tested at Barkley Farm showed a significant head weight and head diameter among varieties tested. Marathon Performa had the largest head diameter than any other variety while Fiesta had the smallest diameter. Results also indicated that Sedona was significantly taller than any other variety, while CMS was the shortest variety with 17.7 inches. All varieties tested in 1999-2000 growing season performed well. Grown under similar conditions and date of planting these varieties are expected to perform well in growers' fields. However Samson variety did not fit into this planting slot. No head was formed by the time the field variety was harvested. Consequently, no evaluation was made on this variety.

Table 1. Data summary of observations collected on broccoli variety trial conducted at Barkley Farms, Yuma 2000-01

| Barkley Seed company | Overall Evaluation (a) | Head Shape (d) | Bead Size (b) | Bead Color (c) | Head Compactness (a) | Uniformity (a) | Field Holding (a) | Head Position (C) | Habit (g) | Stalk (b) | Incidence of Disease (a) | Bracting (a) | Starring (a) | Maturity at Harvest F | Key<br>a) 5= most desirable, 1= undesirable<br>b) s= small, m= medium, l= large, v= variable<br>c) e= exerted, m=medium, l=low<br>d) d= domed, s= semi, f=flat, k=knuckled<br>e) bg= blue green, g=green, yg= yellow green, P purple, Wt=white tip, V=very<br>f) m=medium, o=over, u=under, v=very<br>g) 5=erect, 1=wide<br><br>Comments |   |
|----------------------|------------------------|----------------|---------------|----------------|----------------------|----------------|-------------------|-------------------|-----------|-----------|--------------------------|--------------|--------------|-----------------------|--|---|
| Liberty              | 4.5                    | S              | M             | B G            | 4                    | 4              | 5                 | E                 | E         | L         | 5                        | 5            | 4            | M                     | 1/24   | Nice head shape early variety   |
| Durango              | 4.83                   | D              | S             | G              | 5                    | 5              | 5                 | L                 | S         | S         | 5                        | 5            | 4            | U                     | 1/30   | Nice color, maturity not uniform, some yellow                                       |
| Dinara               | 5                      | D              | L             | B G            | 5                    | 5              | 5                 | M                 | E         | L         | 5                        | 5            | 5            | U                     | 1/30   | Late maturity, nice shape, size and color   |
| Triathlon (Sakata)   | 5                      | D              | S             | Y G            | 5                    | 5              | 5                 | M                 | E         | L         | 5                        | 5            | 5            | M                     | 1/24   | Some yellow Nice color, nice growth habit   |
| Centura              | 4.71                   | D              | S             | Y G            | 5                    | 5              | 5                 | L                 | 4         | L         | 5                        | 4            | 5            | M                     | 1/24   | Domed head, uniform, early maturity   |
| Hybrid SBC 8409      | 4.57                   | S              | S             | Y G            | 4                    | 5              | 5                 | L                 | 4         | L         | 5                        | 4            | 5            | U                     | 1/30   | Small head size, uniform but yellow color   |
| Triathlon            | 5                      | D              | S             | G              | 5                    | 5              | 5                 | M                 | 5         | M         | 5                        | 5            | 5            | M                     | 1/24   | Nice growth habit and height, Late maturity, dark green color, uniform, domed shape |
| Shadow               | 4.42                   | S              | S             | Y G            | 4                    | 5              | 4                 | L                 | 4         | M         | 5                        | 5            | 4            | U                     | 1/24   | Yellowish, late var.  |
| Heritage             | 4.85                   | S              | S             | B G            | 5                    | 5              | 5                 | L                 | 4         | M         | 5                        | 5            | 5            | U                     | 1/24   | Nice dome, late but good growth habit.  |
| Fiesta               | 4.85                   | D              | S             | Y G            | 5                    | 5              | 5                 | L                 | 4         | M         | 5                        | 5            | 5            | U                     | 1/30   | Nice color and growth habit, late variety   |
| Sultan               | 4.28                   | F              | M             | G              | 4                    | 4              | 5                 | L                 | 4         | L         | 5                        | 4            | 4            | M                     | 1/30   | Nice color, lack of compactness   |
| Samson               |                        |                |               |                |                      |                |                   |                   |           |           |                          |              |              |                       |  |   |
| B-14                 | 4.85                   | S              | S             | G              | 5                    | 5              | 5                 | M                 | 4         | L         | 5                        | 5            | 5            | U                     | 1/30   | Nice color, uniform and nice growth habit   |
| Everst               | 4.57                   | S              | M             | B G            | 4                    | 4              | 5                 | L                 | 5         | L         | 5                        | 5            | 4            | M                     | 1/24   | Early variety, nice color, uniform  |

Table 2. Analysis of variance for head diameter and plant height of broccoli varieties grown at Barkley Farms, Yuma, 2000-01.

| Source         | DF | Head height (in.) | Head size (in.) |
|----------------|----|-------------------|-----------------|
|                |    | Pr.>F             | DF              |
| Rep            | 1  | 0.0836            | 0.002           |
| Variety        | 14 | <0.0001           | <0.0001         |
| Sampling (var) | 60 | 0.9138            | 0.9910          |
| R <sup>2</sup> |    | 0.90              | 0.847           |
| CV (%)         |    | 8.38              | 12.52           |



**Fig. 2. Broccoli head diameter (inches) and plant height (inches) and standard deviation. Variety trial conducted in Yuma County, 2000-2001.**