Sensory Quality Attributes of Butterhead Lettuce Cultivars Grown in Arid Conditions

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Abstract. Six butterhead lettuce (*Lactuca sativa* L.) cultivars—'Sorbon' (L2130), 'Donatan' (L2694), 'Jessy', 'Aramir', 'Florian', and 'Suzan'—were grown in the central region of Saudi Arabia. Following harvest and yield assessment, individual heads from each cultivar were selected randomly for subjective sensory evaluation. Among the quality attributes evaluated were color, appearance, head firmness, texture, flavor, and freedom from defects. Attributes were highly correlated with overall quality for each cultivar. 'Florian' attributes were ranked high by members of an evaluation panel. In addition, 'Florian' plants were among the highest yielding cultivars. 'Florian' is recommended for its yield and quality features.

Sensory evaluation of horticultural crops depends on and is affected by diverse factors (Lipton, 1980; Watada, 1980). The present study evaluated the sensory attributes of six cultivars of lettuce grown in fields for two seasons (1989-90 and 1990-91) in central Saudi Arabia. The average temperature and relative humidity during winter growing seasons are shown in Table 1. The experiments were conducted at the Agricultural Research and Experiment Station at Dirab, Riyadh, Saudi Arabia. Cultural practices were uniform among cultivars and during both seasons. The cultivars were 'Sorbon' (L2130), 'Donatan' (L2694), 'Jessy', 'Aramir', 'Florian', and 'Suzan'. Seeds were sown in JV7 pellets (Jiffy Products, Norway) and kept in the greenhouse for 35 days before transplanting on 6 Dec. 1989 and 20 Dec. 1990 for the first and second seasons, respectively. Yields and stability parameters were reported previously by Alsadon et al. (1991).

At harvest, 28 heads from each cultivar were selected randomly, washed, air-dried, wrapped, and distributed to 28 untrained panel members for evaluation. Traits evaluated were color, appearance (shape and bolting), firmness, texture, flavor, defects (mechanical damage, decay, wilting, and tip bum), and overall quality. Evaluation was based on a scale of 1 = very poor, 2 = poor, 3 = fair, 4 = good, and 5 = very good. The evaluation system was adapted from Kader et al. (1973).

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Data were analyzed by the Statistical Analysis System (Ray and Sall, 1982). Correlation coefficients and frequency distribution were used. Data from the two seasons were combined to eliminate panelist bias.

A highly significant correlation existed between each attribute and the overall quality of each cultivar, except texture for 'Sorbon' (Table 2). These correlations suggest that the scale used is valid to evaluate lettuce quality, and each attribute effectively shares in the overall quality. This conclusion is expected, since a good and healthy head lettuce will have an overall quality consisting of many attractive characteristics. Attributes of lettuce cultivars have been described by Ryder (1979).

All cultivars except 'Florian' were similar to each other (Table 3). Among the cultivars tested, 'Florian' was considered best overall; 75% of the panel ranked 'Florian' good and very good in all categories (Table 4). 'Florian' lettuce had higher mean values of color, appearance, and freedom from defects and lower

SDs, except for appearance, than the other

Table 1. Temperature and relative humidity data during 1989-90 and 1990-91 growing seasons.^a

Period	Temp (°C)				Relative humidity (%)			
	Max		Min		Max		Min	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range
1989-90 Season								
Dec. 1989	22	16-31	9	2-20	62	28-73	9	3-17
Jan. 1990	19	12-29	6	0-12	80	6-98	34	12-60
Feb. 1990	22	14-30	8	0-15	74	8-96	33	19-74
1990-91 Season								
Dec. 1990	27	14-30	6	(-2)-10	84	65-95	26	14-45
Jan. 1991	20	9-29	7	(-3)-15	87	59-95	38	18-70
Feb. 1991	24	19-35	9	1-17	64	27-95	34	17-58

^aData were collected by the weather station of the Agricultural Research and Experiment Station, College of Agriculture, at Dirab, Riyadh, Saudi Arabia. Data cover the period from transplanting in the open field until harvest (4 Feb. 1990 and 25 Feb. 1991, respectively).

Table 2. Correlation coefficients between the overall quality and other attributes of butterhead lettuce cultivars during 1989-90 and 1990-91 growing seasons.

Cultivar	Attribute					
	Color	Appearance	Firmness	Texture	Flavor	Defects
Sorbon	0.802**	0.678**	0.750**	0.312 ^{ns}	0.710**	0.524**
Donatan	0.754**	0.864**	0.727**	0.630**	0.747**	0.729**
Jessy	0.693**	0.748**	0.751**	0.834**	0.917**	0.606**
Aramir	0.707**	0.648**	0.682**	0.619**	0.743**	0.623**
Florian	0.747**	0.818**	0.728**	0.731**	0.713**	0.659**
Suzan	0.611**	0.618**	0.604**	0.693**	0.415*	0.479**

^{ns},**Nonsignificant or significant at $P = 0.05$ or 0.01 , respectively.

Table 3. Statistics of sensory ranking scores ($\bar{X}$ = ranking means from 28 panelists).

Attribute	Statistic	Cultivar					
		Sorbon	Donatan	Jessy	Aramir	Florian	Suzan
Color	$\bar{X}$	3.21	3.28	3.50	3.21	4.17	3.14
	SD	1.19	1.08	1.38	1.13	1.02	1.26
Appearance	$\bar{X}$	3.07	3.25	3.00	2.92	3.35	2.61
	SD	1.02	1.07	1.08	1.05	1.36	1.06
Firmness	$\bar{X}$	3.21	3.53	3.00	3.25	3.42	3.00
	SD	1.31	1.07	1.12	1.10	1.39	1.12
Texture	$\bar{X}$	3.25	3.75	3.46	3.39	3.64	3.39
	SD	1.04	0.79	1.17	1.06	1.06	1.16
Flavor	$\bar{X}$	3.35	2.93	3.39	3.39	3.96	3.46
	SD	1.02	1.18	1.16	1.10	0.96	1.17
Freedom from defects	$\bar{X}$	3.18	2.82	3.60	3.25	3.82	3.03
	SD	1.22	1.18	1.06	1.17	1.12	1.10
Overall quality	$\bar{X}$	3.21	3.26	3.32	3.23	3.73	3.10
	SD	0.72	0.79	0.85	0.74	0.85	0.65

Table 4. Frequency percentage of individual attribute rankings and overall quality of six butterhead lettuce cultivars.

		Cultivar					
Attribute	Ranking ^z	Sorbon	Donatan	Jessy	Aramir	Florian	Suzan
<i>Percent</i>							
Color	1	4	4	4	7	0	11
	2	32	25	18	21	11	25
	3	21	21	25	25	11	18
	4	25	39	32	36	29	32
	5	18	11	21	11	50	14
Visual quality	1	7	0	11	4	7	18
	2	21	32	21	40	29	29
	3	32	25	29	25	14	29
	4	36	29	36	25	21	25
	5	4	14	4	7	29	0
Firmness	1	14	0	7	4	14	11
	2	18	21	36	29	11	18
	3	14	25	11	18	21	43
	4	40	32	43	39	25	18
	5	14	21	4	11	29	11
Texture	1	4	0	4	4	0	4
	2	21	11	25	18	21	25
	3	32	14	11	29	14	18
	4	32	64	43	36	43	36
	5	11	11	18	14	21	18
Flavor	1	4	11	4	7	0	11
	2	18	32	25	14	11	7
	3	29	18	18	21	14	21
	4	39	32	36	46	43	46
	5	11	7	18	11	32	14
Freedom from defects	1	7	11	4	4	4	7
	2	32	39	14	29	11	32
	3	7	14	18	25	18	14
	4	43	29	46	25	36	43
	5	11	7	18	18	32	4
Overall quality	1	7	0	4	4	0	0
	2	11	18	18	7	11	14
	3	32	36	25	40	14	36
	4	50	36	39	43	36	46
	5	0	11	14	7	39	4

^zRanking scale: 1 = very poor, 2 = poor, 3 = fair, 4 = good, 5 = very good.

cultivars. The results were similar for texture, flavor, and overall quality. 'Florian' produces well-filled heads and tolerates unfavorable field conditions well (Alsadon et al., 1991).

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