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Spanish and Storage
Onion Trials 1993
and Four-year
Compendium

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SUMMARY

In 1993, 10 cultivars of Spanish onions and seven cultivars of storage onions were grown at Windsor in a sandy terrace soil and at Mt. Carmel on a loamy upland soil. At Windsor, the average yield of 10 Spanish onion cultivars was 725 50-lb bags/A compared to 451 50-lb. bags/A at Mt. Carmel, a 61% difference. At Windsor, the yield of Ole exceeded 1,000 50-lb bags/A. Yield of Daytona, Oro Grande, Ringmaker, and Robin exceeded the national average of 720 50-lb. bags/A. At Mt. Carmel, no Spanish cultivar exceeded the national average. The greatest yield was from Hybrid Big Mac with 540 50-lb bags/A.

At Windsor, the average yield of seven cultivars of storage onions was 685 50-lb. bags/A compared to 434 50-lb. bags/A at Mt. Carmel, a 58% difference. The higher yields of Spanish and storage onions at Windsor was due to increased bulb weight and a greater percent harvested. At Windsor, yield of Corona exceeded 900 50-lb. bags/A and yield of Prince exceeded the national average. At Mt. Carmel, no cultivars exceeded the national average. The greatest yield was from Sweet Sandwich with 569 50-lb. bags/A.

At Windsor, Ole (20%) and Ringmaker (10%) had the greatest yield of colossal size Spanish onions. Yield of jumbo size Spanish onions exceeded 80% in Celebrity, Daytona, Gringo, and Robin. At Mt. Carmel, the yield of jumbo size Spanish onions exceeded 70% in Hybrid Big Mac, Ole, and Ringmaker. Among storage types, yield of jumbo size onions exceeded 50% in Corona and Prince.

In storage, the Spanish types, Daytona and Robin remained dormant for 7 months or more and would be suitable for late winter and early spring sales. Among the storage types, Copra and Prince had no sprouting after 7 months.

In 4 years of trials, the Spanish cultivars Daytona, Ole, Oro Grande, and Robin have shown consistent yield and quality. Daytona had the longest storage capability. Among the storage types, Prince, Corona, and Sweet Sandwich have shown consistently high yields and quality. Copra, Prince, and Wolverine had the longest storage capability.

Spanish and Storage Onion Trials 1993 and Four-year Compendium

By David E. Hill

Among all vegetables mentioned in a recent national survey of consumer preference, consumers did not purchase onions because of convenience or health benefits such as vitamins or fiber content (Anon. 1994). Despite their lack of perceived value, the per-capita consumption of onions in the United States has risen from 9.9 pounds in 1970 to 15.2 pounds in 1992 (Unrein 1993). The annual production now exceeds 2.5 billion pounds and places onions fourth among all vegetables (Anon. 1991). They are an essential ingredient in mixed vegetable dishes, soups, salads, meat garnishes and gravies. Despite their pungent taste, 21% of all consumers prefer to eat them raw (Anon. 1994). Simply, they are consumed in large quantities because they taste good.

Onions are divided into sweet Spanish types whose bulbs grow to 3-5 inches and smaller storage types that grow to 2-3.5 inches. The bulbs of both Spanish and storage onions are yellow, white, or red.

Early onion production in Connecticut

Onions have been grown in Connecticut since Colonial days. Wethersfield became the center of commercial production in the 18th Century but gradually shifted to production of onion seed. Onion production was profitable during the Civil War for farmers in Fairfield County. In 1871, 300,000 to 500,000 bushels were raised in Southport and Westport (Jenkins 1925).

Natural selection by Connecticut growers in the 1800's provided several commercial cultivars; Wethersfield Red, Southport Yellow, Red, and White Globes. These heirloom varieties survive today in commercial production in the Northeast.

Current outlook

The recent rapid growth of the foodservice (fast-food chains, school and corporate cafeterias, and hospitals) and

processing (fried onion rings, peeled onions) industries has created a large demand, especially for Spanish onions. Because of a price advantage in late summer and early fall markets before western onions are harvested in October, there is opportunity for Connecticut farmers to grow onions for profit. A winter price advantage was amply demonstrated in 1993-1994 when northwestern growers lost much of their production to heavy rains. This caused winter prices to exceed \$20.00/50-lb bag compared to a normal price of \$6.00-\$8.00/50-lb bag.

In 1993, 10 cultivars of Spanish onions and seven cultivars of storage onions were grown from transplants at the Valley Laboratory in Windsor and Lockwood Farm in Mt. Carmel. I report yield and quality in this bulletin. Since storage quality is one of the most important characteristics of onions (Magruder et al. 1941), I shall also report on their durability in cold storage during winter months. Strategies to maximize yield are also discussed. Finally, I shall summarize the 4-year project by identifying and describing the characteristics of onion cultivars best suited to Connecticut's soil and climate.

METHODS AND MATERIALS

Soils

Onion trials were conducted at the Valley Laboratory in Windsor on Merrimac sandy loam, a well drained sandy terrace soil with somewhat limited moisture holding capacity and at Lockwood Farm in Mt. Carmel on Cheshire fine sandy loam, a well drained loamy upland soil with moderate moisture holding capacity.

Cultivars

Seeds were obtained from several domestic and foreign seed suppliers. Yellow, red, and white cultivars of Spanish

and storage types were included. They are grouped as follows:

YELLOW SPANISH: Celebrity, Daytona, Gringo,
Hybrid Big Mac, Ole, Oro Grande, Ringmaker,
Valiant

RED SPANISH: Robin (Tested as BGS 63)

WHITE SPANISH: White Keeper

YELLOW STORAGE: Copra, Corona, Prince, Sweet
Sandwich, Wolverine

RED STORAGE: Benny's Red, Mambo

Culture

Three rows of seed were sown March 19 in shallow trays, 21 X 11 X 2.5 inches, filled with Promix BX in a greenhouse maintained at 50-70F. Seedlings in the trays were lightly thinned to avoid overcrowding after reaching 1-1.5 inches height. After 5 weeks, the seedlings were moved to a coldframe for hardening 14 days before planting in the field. Water soluble 20-20-20 fertilizer (1 tbs/gal) was added to the seedlings 1 week before transplanting. During May 11-14, the seedlings were transplanted at both sites in 20-foot rows that were 18 inches apart. Cultivar rows were randomly planted in three replications. Spanish onion transplants were set 6 inches apart within rows; storage onion transplants, 4 inches apart. At each site, the plots were irrigated following transplanting and initial preemergence application of herbicide. At Windsor, the crops were irrigated four more times during the growing season; at Mt. Carmel, three more times. About 1 inch of water was applied at each irrigation.

Fertilizer amendments

At Windsor, the soil was initially fertilized with 740 lb/A 10-10-10 and limed to attain pH 6.5 before planting. In early June, the crop was sidedressed with 300 lb/A 10-10-10 at the five-leaf stage. In late-June, an additional sidedressing of 90 lb/A ammonium nitrate was applied. At Mt. Carmel, initial preplant fertilization was 1200 lb/A 10-10-10 followed by a sidedressing of 90 lb/A ammonium nitrate at the five-leaf stage. Total fertilization supplied 134 lb N/A at Windsor and 150 lb N/A at Mt. Carmel. No lime was added to the soil at Mt. Carmel.

Weed and insect control

At both sites, weeds were controlled with Dacthal 75W (10 lb/A) applied immediately after transplanting. Weeds that emerged after transplanting were controlled with Goal 1.6E (4 oz/A). At Windsor four applications of Goal controlled late germinating weeds; at Mt. Carmel, one application. Root maggots were controlled with Lorsban 4E (1.1 oz/1000 feet of row) applied as a soil drench immediately

after transplanting. Foliar damage by onion thrips was controlled with Diazinon 50W (1 lb/A).

Harvest and storage

After half of the plants in each cultivar toppled, those remaining erect were bent over to ensure even maturity. After the tops began to wither, the bulbs were uprooted and air dried for 7-10 days. After cutting the tops, the bulbs were weighed and graded by diameter according to USDA and commercial standards as follows:

Colossal	≥ 4.0"
Jumbo	3.0 - 4.5"
Medium	2.0 - 3.5"
Small	1.0 - 2.25"

After weighing and grading, 40 bulbs from each cultivar were randomly selected, placed in wire baskets, and stored at 34F and 70% relative humidity. After 12, 19, 24, and 28 weeks, rotted or sprouted bulbs were counted and removed from the sample. At 12, 19 and 24 weeks, ten bulbs from the stock of each cultivar were removed from cold storage and placed in darkened storage at 60F. At 28 weeks, the remaining bulbs were placed in darkened storage. After 3 weeks in darkened storage, losses due to rotting or sprouting were measured.

Rainfall

Rainfall distribution throughout the growing season, May-September, is shown in Figure 1. Each bar represents the departure from the mean monthly rainfall for Hartford and Mt. Carmel reported by the National Weather Service. In 1993, total rainfall during May-September was 15.0 inches at Windsor and 11.5 inches at Mt. Carmel, compared to averages of 16.0 and 16.6 inches respectively at each site. The total rainfall at Mt. Carmel was 5.1 inches below average; water deficits occurred in the soil from June through August. Slow plant growth during this period was somewhat alleviated by irrigation. At Windsor, several localized thunderstorms in July provided sufficient water for the growing crop. Moisture deficits in June and August were alleviated by irrigation.

YIELDS

Spanish onions

At Windsor, the average yield of 10 cultivars was 725 50-lb bags/A compared to 451 50-lb bags/A at Mt. Carmel, a 61% difference. The higher average yield at Windsor was due to increased bulb weight (11.9 oz vs 8.5 oz) and greater average percent harvested (83 vs. 72) compared to Mt. Carmel, Table 1. Yield of Ole exceeded 1000 50-lb bags/A because of heavy bulbs and high percent harvested. Yield of Robin (a red cultivar), Daytona, Oro Grande, and Ringmaker exceeded the national average of 720 50-lb bags/A

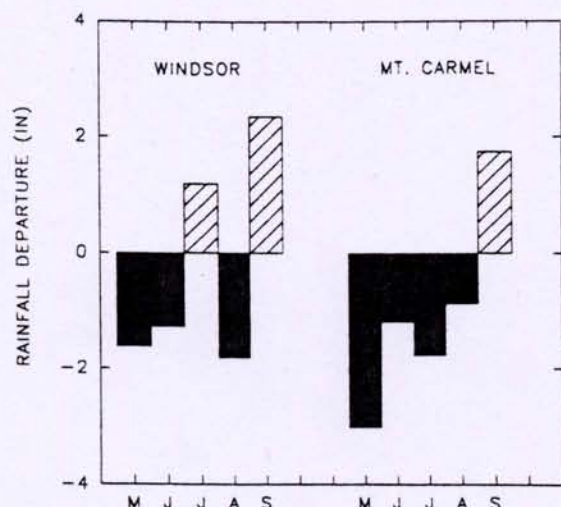


Figure 1. Departure from normal rainfall during the 1993 growing season at Windsor (left) and Mt. Carmel (right).

(USDA 1990). Valiant had the greatest percent harvested, but yield was less than the national average because of its small bulb size compared to all other Spanish cultivars. Low yield of White Keeper was due to excessive production of bulbs with double centers, which were prone to rotting.

At Mt. Carmel, no Spanish cultivars exceeded the national average yield of 720 50-lb bags/A. Yield of Ringmaker, Ole, Daytona, and Hybrid Big Mac, exceeded 540 50-lb bags/A.

Storage onions

At Windsor, the average yield of seven cultivars was 685 50-lb bags/A compared to 434 50-lb bags/A at Mt. Carmel, a 58% difference. The higher average yield at Windsor compared to Mt. Carmel was due to increased bulb weight (7.7 oz vs 5.3 oz) and greater percent harvested (81 vs 76), a pattern similar to Spanish onions. Yield of Corona exceeded 900 50-lb bags/A because of heaviest bulbs and highest percentage harvested among all storage cultivars. Prince also exceeded the national average of 720 50-lb bags/A. Among the red storage cultivars, Benny's Red had the greatest yield due solely to greater bulb weight.

At Mt. Carmel, no storage cultivars exceeded the national average yield. The yield of Sweet Sandwich exceeded 550 50-lb bags/A: Benny's Red, Corona, Prince, and Copra exceeded 400 50-lb bags/A.

SIZE GRADES

Spanish onions

At Windsor, fully 79% of all Spanish onions, grown from transplants, exceeded 3 inches diameter and were

graded jumbo (74%) or colossal (5%) size, Table 2. Ole had the greatest yield of colossal size followed by Ringmaker. Yield of jumbo onions exceeded 80% in Robin, Celebrity, Daytona, and Gringo. The majority of Valiant onions graded medium size in contrast to 1992 trials when jumbo size prevailed (Hill 1993).

At Mt. Carmel, 51% of all Spanish onions exceeded 3 inches diameter and were graded jumbo. Ole had the greatest yield of jumbo size. Only Ringmaker produced colossal size onions (2%). No cultivar yielded at least 80% jumbo size. At Mt. Carmel, 46% of all Spanish onions graded medium.

Storage onions

At Windsor, 38% of all storage onions, grown from transplants, exceeded 3 inches diameter and were graded jumbo. Corona had the greatest yield of jumbo onions (67%). At Mt. Carmel, only 10% of all storage onions exceeded 3 inches diameter and were graded jumbo. Among the red cultivars, Benny's Red had the greatest yield of jumbo size (33%). Fully 82% of all onions were graded medium.

STORAGE DURABILITY

Onions are stored to permit winter and early spring sales. Although Spanish onions are generally sold soon after harvest, most can be stored up to 3 months or even longer. For example, Daytona, was found to be durable up to 6 months in cold storage (Hill 1993). Under proper temperature and humidity, some storage onions can be stored nearly a year. In these durability trials, both Spanish and storage onions were placed in cold storage for 12-28 weeks, then at 60F for an additional 3 weeks. Table 3 shows the percentage loss from rotting in cold storage and sprouting following 3 additional weeks at 60F. Rotted bulbs included those whose centers were decayed and those whose outer scales were soft to the touch, but with sound inner scales. Sprouted bulbs were those whose necks were breached by newly elongating leaves.

Among the Spanish types, Celebrity had the greatest rotting loss in cold storage. This cultivar, however, was extensively damaged from sun scald during field drying, which probably resulted in exposure of weakened tissue for invasion by decay organisms. Rotting losses of Gringo and Ole were a modest 10%.

Among the storage types, Mambo had the highest rotting loss in cold storage. Most storage cultivars had very low rotting losses, a common trait of storage onions with hard outer scales.

After 12, 19, 24 and 28 weeks, samples were removed from cold storage and placed at room temperature for 3 weeks to represent a common interval between storage

Table 1. Yield of Spanish and storage onions grown from transplants at Windsor and Mt. Carmel, 1993. (R) = red; (W) = white; all others are yellow.

	Windsor			Mt. Carmel		
	Hvst. %	Avg. bulb oz.	50-lb* bags No./A**	Hvst. %	Avg. bulb oz.	50-lb* bags No./A**
SPANISH TYPES						
Celebrity	68	13.5	666 bc	72	9.2	481 abcd
Daytona	90	11.8	771 ab	89	8.9	575 bc
Gringo	80	12.1	703 b	66	8.1	388 abcd
Hyb. Big Mac	75	12.0	653 bc	73	10.2	540 abcd
Ole	95	15.8	1090 a	76	10.7	590 ab
Oro Grande	97	11.4	803 ab	63	8.1	370 abcd
Ringmaker	88	12.9	824 ab	78	10.5	595 abc
Robin (R)	91	11.2	740 b	79	6.3	361 abcd
Valiant	98	9.0	640 bc	58	7.4	312 d
White Keeper (W)	50	9.8	356 c	69	6.0	301 d
STORAGE TYPES						
Benny's Red (R)	69	8.6	646 ab	66	6.5	467 a
Copra	89	6.6	640 a	80	4.8	418 abc
Corona	95	8.8	910 ab	81	5.3	468 abc
Mambo (R)	58	7.9	499 ab	59	5.1	328 b
Prince	94	7.9	809 ab	86	4.7	440 abc
Sweet Sandwich	77	7.7	646 b	78	6.7	569 ac
Wolverine	88	6.7	642 ab	80	4.0	348 ac

*Based on: Spanish types, 58,080 plants/A (6" x 18")
Storage types, 87,120 plants/A, (4" x 18")

**Mean separations within columns for each type by Tukey's HSD multiple comparison test at $P = 0.05$. Values in columns followed by the same letter within each type did not differ significantly.

removal and consumer purchase. Among Spanish types, Celebrity, Gringo, and White Keeper had the highest rates of sprouting after 12 weeks and suggests that their dormancy was shortest among the cultivars tested. Dormancy in Ole was maintained about 4 weeks longer while Oro Grande and Valiant retained dormancy up to 24-28 weeks. Robin and Daytona had the longest dormancy period among all Spanish cultivars.

Among the storage types, Mambo and Wolverine showed some dormancy loss after 24 weeks. Benny's Red and Corona began to sprout extensively after 28 weeks. Copra and Prince had the longest dormancy period and bulbs were stored up to 28 weeks.

From these records of sprouting loss during extensive storage, we can estimate the last month of storage, Table 4. This corresponds to the month preceding the storage interval when at least 20% of the sample began to sprout.

MANAGEMENT STRATEGIES

Site selection

The data from Tables 1 and 2 suggest that light sandy soils produce greater yields of both Spanish and storage onions than heavier loamy soils. This is consistent with earlier observations at the same sites (Hill 1992, 1993). Although yield on loamy soil can be improved 10-15% by addition of 1-inch leafmold, it seldom reaches the national average of 720 50-lb bags/A.

Fertilization and irrigation

Maximum yield of onions requires optimum nitrogen and moisture supplies, especially during bulb formation which begins when daylength reaches 15 hours for long-day cultivars (Splittstoesser 1979). In sandy soil, initial preplant application of 800-1000 lb/A 10-10-10 fertilizer followed by sidedressings of 90 lb/A ammonium nitrate at the five-leaf

Table 2. Size grades of Spanish and storage onions grown from transplants at Windsor and Mt. Carmel, 1993. (R) = red; (W) = white; all others are yellow.

	Windsor				Mt. Carmel			
	Colossal 4"+ %	Jumbo 3-4" %	Med 2-3" %	Small 1-2" %	Colossal 4"+ %	Jumbo 3-4" %	Med 2-3" %	Small 1-2" %
SPANISH TYPES								
Celebrity	6	81	13	-	-	52	44	4
Daytona	2	92	6	-	-	46	52	2
Gringo	2	83	15	-	-	54	44	2
Hyb. Big Mac	4	69	27	-	-	71	28	1
Ole	20	73	7	-	-	75	23	2
Oro Grande	3	72	25	-	-	49	49	2
Ringmaker	10	77	13	-	2	72	26	-
Robin (R)	4	84	12	-	-	38	59	3
Valiant	-	47	53	-	-	31	66	3
White Keeper (W)	2	65	31	2	-	23	74	3
STORAGE TYPES								
Benny's Red (R)	-	38	61	1	-	33	64	3
Copra	-	23	76	1	-	2	94	4
Corona	-	67	33	-	-	10	82	8
Mambo (R)	-	40	60	-	-	6	90	4
Prince	-	54	46	-	-	3	85	12
Sweet Sandwich	-	33	67	-	-	17	83	-
Wolverine	-	14	86	-	-	3	79	18

Table 3. Rotting losses (%) of onions after 28 weeks of cold storage (34F), sprouting losses in samples removed from cold storage after 12, 19, 24 and 28 weeks and stored at room temperature (60F), and estimated last storage month. All onions were placed in cold storage the week of September 10.

SPANISH TYPES	Rotting Losses %	12-week Sample %	Sprouting Losses			Last Storage Month
			19-week Sample %	24-week Sample %	28-week Sample %	
Celebrity	20	20	20	10	0	Dec
Daytona	0	0	0	0	0	May+
Gringo	11	20	10	20	80	Dec
Hyb. Big Mac	8	0	10	20	50	Feb
Ole	10	0	30	10	20	Jan
Oro Grande	4	0	0	10	20	Apr
Ringmaker	4	10	10	20	40	Feb
Robin	2	0	0	10	0	May
Valiant	0	0	0	0	20	Mar
White Keeper	8	30	20	20	40	Dec
STORAGE TYPES						
Benny's Red	4	0	0	10	50	Mar
Copra	0	0	0	0	0	May+
Corona	0	0	0	10	50	Mar
Mambo	8	0	10	30	60	Feb
Prince	2	0	0	0	0	May+
Sweet Sandwich	2	10	0	0	10	Apr
Wolverine	0	10	0	20	10	Feb

stage in early June and again in late June should supply adequate nitrogen during the critical time of bulb formation. The second sidedressing is especially useful if heavy rains in June leach the sandy soil. Soil tests can verify nitrogen depletion. In loamy soil, an initial preplant application of 1000-1200 lb/A 10-10-10 fertilizer followed by a sidedressing of 90 lb/A ammonium nitrate in early June is sufficient.

Onions should receive at least 1 inch of water each week from rainfall or irrigation from transplanting through completion of bulb formation. Irrigation applied after the leaves begin to topple increases the probability of neck rot.

Harvest and storage

Mature bulbs were harvested and field dried for 7-10 days to form hardened outer scales. Preferably, they should be protected from the sun to prevent scalding which depresses the outer scales on exposed surfaces. If left in the field too long, cultivars with short dormancy periods sprouted in the field or shortly after they were placed in storage. Alternatively, anti-sprouting agents such as maleic hydrazide (MH 30) can be sprayed on the crop a few days before harvest while the plants are still green. Our tests in 1992 showed that MH 30 improved the percentage of marketable bulbs of storage onions 12-40% after 21-25 weeks, but had little effect on extending the dormancy or reducing sprouting of Spanish onions (Hill 1993). Bulbs stored at 34F and relative humidity of 50-70% maintained dormancy from 3-6 months.

COMPENDIUM, 1990-1993

The onion trials were established to identify cultivars that are best suited to Connecticut's soil and climatic variations. Cultivars that yielded well and produced quality bulbs the first year were repeated and new cultivars were added to the trials. Cultivars that failed to attain the national average yield of 720 50-lb bags/A (USDA 1990) or that developed poor quality in storage were dropped from testing. By elimination, I have identified several cultivars that withstood up to 4 years of variable heat, cold, drought, and wetness to produce high yields with excellent quality. It should be noted, however, that the cultivars identified in this summary are reliable, but not infallible due to weather extremes. Cultivars dropped from testing because of poor yields or quality in the first 2 years may have been treated too harshly, but it was impractical to test 35 cultivars each year to determine their true probability of success. Some new cultivars, tested late in the program, may have had insufficient time to determine their performance under varying weather.

Table 4 lists yields of all cultivars tested 1990-1993. Additional details of their yield and quality may be found in

this Bulletin and Bulletins 906 and 915 of this Station. The most reliable cultivars will now be described.

Spanish types

1. Robin is a new red cultivar tested only in 1993. The bulbs are large, somewhat flattened globes with thick, deep red outer scales. The red color is intense throughout the bulb. In sandy soil, the bulbs have a high proportion of jumbo size with some reaching colossal size. Field loss was very low and the yield exceeded the national average. It is an excellent keeper whose dormancy extends into April with a low percentage of culling. It can be stored through May and is best suited for fall to early spring sales. Its maturity is about 110 days.

2. Daytona is a yellow cultivar tested for 2 years. Its large, globe-shaped bulbs have thick, dark brown outer scales. In sandy soil, a very high proportion of the bulbs were jumbo size. Field loss was very low and the yield exceeded the national average in both years of trial, with over 1000 50-lb bags/A one year. Among all Spanish cultivars, Daytona had the best keeping quality. The bulbs remained dormant through May with very little culling. It is highly suited for late winter and early spring sales. Its maturity is about 120 days.

3. Gringo is a yellow cultivar tested for 3 years. Its bulbs are large, deep globes whose copper colored outer scales are medium thick. In sandy soil, the bulbs had a high proportion of jumbo size; a small proportion attained colossal size. Although field loss was slightly greater than average, large bulbs permitted yields that were above or slightly below the national average in all 3 years of trials. It can be stored through December and is best suited for fall and winter sales. Its maturity is about 105 days.

4. Hybrid Big Mac is a yellow cultivar tested for 3 years. Its bulbs are large globes whose light brown outer scales are medium thick. In both sandy and loamy soil, the bulbs had a high proportion of jumbo size with a few colossal size. Yield was above the national average in 2 of 3 years and within 10% the other year. It can be stored through February and is best suited for fall and winter sales. Its maturity is about 120 days.

5. Ole is a yellow cultivar tested only in 1993. Its bulbs are very large globes whose medium dark brown outer scales are moderately thick. In sandy soil, the bulbs had a high proportion of jumbo size and the highest percentage of colossal (20) size. In loamy soil, it had the highest proportion of jumbo size bulbs. The yield was outstanding and exceeded 1000 50-lb bags/A in the first year of trial. It can be stored through January and is best suited for fall and winter sales. Its maturity is about 105 days.

6. Oro Grande is a yellow cultivar tested for 2 years. Its

Table 4. Four-year compendium of Spanish and storage onions. Yield is in 50-lb bags/A. Dash = not grown.

	Windsor				Mt. Carmel			
	1990	1991	1992	1993	1990	1991	1992	1993
SPANISH TYPES								
Ailsa Craig	-	767	1003	-	-	-	387	-
Big Red	-	213	178	-	-	82	207	-
Celebrity	-	-	-	666	-	-	-	481
Colorado #6	-	-	495	-	-	-	330	-
Daytona	-	-	1071	771	-	-	315	575
Gringo	-	929	786	703	-	110	284	388
Hyb. Big Mac	-	799	840	653	-	-	470	540
Ole	-	-	-	1090	-	-	-	590
Oro Grande	-	-	1054	803	-	-	507	370
Ringmaker	1269	659	673	824	740	143	348	595
Riverside	1097	517	521	-	770	87	352	-
Robin	-	-	-	740	-	-	-	361
Snow White	-	-	755	-	-	-	258	-
Valiant	-	620	832	640	-	129	696	312
White Keeper	-	-	680	356	-	-	291	301
White Sweet Sp.	-	381	256	-	-	-	342	-
Yellow Sweet Sp.	-	-	648	-	-	-	433	-
Yellow Valencia	-	-	238	-	-	-	305	-
STORAGE TYPES								
Benny's Red	-	-	350	646	-	-	475	467
Carmen	741	405	-	-	668	144	-	-
Copper King	-	572	-	-	-	150	-	-
Copra	795	477	891	640	501	186	680	418
Corona	-	-	1043	910	-	-	580	468
Early Yellow Globe	-	653	834	-	-	237	279	-
Granite	-	-	580	-	-	-	496	-
Lucifer	-	452	-	-	-	174	-	-
Mambo	-	-	-	499	-	-	-	328
Norstar	-	418	-	-	-	267	-	-
Prince	-	-	1039	809	-	-	695	440
Red Man	-	464	309	-	-	161	631	-
Southport Red	949	-	-	-	606	-	-	-
Sweet Sandwich	827	-	801	646	625	161	484	569
Tamarack II	1229	537	-	-	555	145	-	-
Tango	-	423	-	-	-	-	-	-
Wolverine	-	608	862	642	-	228	505	348

bulbs are large blocky globes whose medium bronze outer scales are moderately thick. In sandy soil, the bulbs had a fairly high proportion of jumbo size and yields that exceeded the national average each year and over 1000 50-lb bags/A in 1992. It can be stored through April and is best suited for fall to late winter sales. Its maturity is about 107 days.

7. Ringmaker is a yellow cultivar tested for 4 years. Its bulbs are large, blocky globes whose medium dark brown outer scales are moderately thick. In sandy soil, the bulbs had a high proportion of jumbo size and the second highest percentage (10) of colossal size. Yields were above the national average in 2 of 4 years and exceeded 1000 50-lb bags/A in 1990. Yield was also within 10% of the national average in the remaining 2 years. In loamy soil, yield exceeded the national average in 1 of 4 years. It can be stored through February and is best suited for fall and winter sales. Its maturity is about 108 days.

Storage onions

1. Copra is a yellow cultivar tested for 4 years. Its bulbs are medium to large globes whose dark brown outer scales are very thick, forming a tight neck when cured. In sandy soil, the bulbs had equal proportions of jumbo and medium sizes. Yield was above the national average in 2 of 4 years. Its storage quality is outstanding and remains dormant in cold storage beyond May. It is best suited for winter through spring sales. Its maturity is about 107 days.

2. Corona is a highly productive yellow cultivar tested for 2 years. Its bulbs are large, slightly flattened globes whose yellow brown outer scales are moderately thick. In sandy soil, the bulbs had the highest percentage (67) of jumbo size of all storage cultivars tested. Yield was above the national average in each year tested and exceeded 1000 50-lb bags/A in 1992. Corona can be stored through March and is most suitable for fall and winter sales. Its maturity is about 95 days.

3. Prince is a highly productive yellow cultivar tested for 2 years. Its bulbs are medium to large blocky globes whose golden brown scales are thick and adhere well in long-term

storage. In sandy soil, the bulbs had equal proportions of jumbo and medium sizes. Yield exceeded the national average each year and exceeded 1000 50-lb bags/A in 1992. Its storage quality was excellent and it remained dormant beyond May with little culling. It is best suited for winter and early spring sales. Its maturity is about 105 days.

4. Sweet Sandwich is a yellow cultivar that was tested for 4 years. Its bulbs are medium to large blocky globes whose tan outer scales are moderately thick and form a tight neck when cured. In sandy soil, the bulbs had a greater proportion of medium size with 30-40% jumbo size. Yield exceeded the national average in 2 of 4 years. It can be stored through April and is best suited for fall to late winter sales. Its maturity is about 110 days.

REFERENCES

Anonymous. 1991. Produce availability and merchandising guide. The Packer. Vance Publishing Company. Lincolnshire, IL 444p.

Anonymous. 1994. Fresh trends: a profile of the fresh produce consumer. The Packer. Vance Publishing Company. Lincolnshire IL 104p.

Hill, D.E. 1992. Onion trials 1990-1991. The Conn. Agr. Exp. Sta., New Haven. Bulletin 906. 10p.

Hill, D.E. 1993. Storage and Spanish onion trials 1992. The Conn. Agr. Exp. Sta., New Haven. Bulletin 915. 11p.

Jenkins, E.H. 1925. Connecticut agriculture. *In* History of Connecticut. States History Co. p. 289-424.

Magruder, R., Webster, R.E., Jones, H.A., Randall, T.E., Snyder, G.B., Brown, H.D., and Hawthorn, L.R. 1941. Storage quality of the principal American varieties of onions. USDA Circular 618. 48p.

Unrein, J. 1993. A meeting of ideas, issues, education. The Packer. February 27, 1993.

USDA 1990. Agricultural statistics 1990, USDA 517p.



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