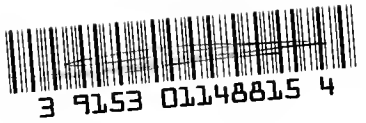

The Connecticut Agricultural Experiment Station, New Haven

Onion Trials 1990-1991

BY DAVID E. HILL

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SUMMARY

In 1990-91, nine to 19 cultivars of Spanish and storage onions were grown at Windsor in a sandy terrace soil and at Mt. Carmel in a loamy upland soil. In 1990, half of the plots in both soils were amended with 1-inch composted leaves. The average yield of transplanted Spanish onions and storage onions at Windsor was 1052 and 896 50-lb bags/A in compost-amended soil compared to 1183 and 908 50-lb bags/A in unamended soil, respectively. At Mt. Carmel, the average yield of transplanted Spanish onions and storage onions was 867 and 666 50-lb bags/A in compost-amended soil compared to 755 and 591 50-lb bags in unamended soil, respectively. Compost amendments increased yields of Spanish and storage onion cultivars 10 to 30% in the loamy soils at Mt. Carmel but did not benefit yield in the sandy soil at Windsor. Yield of direct-seeded onions at both sites in compost-amended soil and unamended controls were less than 400 50-lb bags/A, well below the national average of 720 50-lb bags/A. The sandy soil at Windsor produced average yields that were more than 50% greater for transplanted Spanish and storage onions than the heavier loamy soil at Mt. Carmel.

In 1991 the average yield of transplanted Spanish onions was 610 50-lb bags/A at Windsor compared to 112 50-lb bags/A at Mt. Carmel. Despite irrigation, the crop at Mt. Carmel grew very slowly in June when average rainfall was one inch below normal. The stunted plants formed only small to medium sized bulbs in July and August. Although the average yield of transplanted Spanish onions at Windsor was 5-fold greater than at Mt. Carmel, it was 47% less than in 1990, a year of ample rain throughout the growing season. The average yield of storage onions was 501 50-lb bags/A at Windsor compared to 185 50-lb bags/A at Mt. Carmel.

Among the Spanish onion cultivars, yields of Riverside and Ringmaker exceeded 1000 50-lb bags/A in 1990. Yields of Gringo and Hybrid Big Mac exceeded 800 50-lb bags/A in 1991. Among the storage types, yields of Early Yellow Globe and Wolverine exceeded 600 50-lb bags/A in 1991.

Valiant and Riverside Spanish onions were most durable in storage. Losses from sprouting were less than 25% after 19 weeks in cold storage followed by 3 weeks at room temperature. Among the storage types, less than 10% of Copra and Wolverine sprouted after 16 weeks of cold storage followed by by 3 weeks at room temperature.

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Onions rank fourth among all vegetables produced for consumption in the United States, exceeded only by potatoes, lettuce, and tomatoes. According to USDA statistics, 2.5 billion pounds are produced annually with California, Texas, New York, and Oregon as major suppliers (The Packer 1991). Onions are available year-round because of their capability of long-term storage supplemented with late-winter imports from Mexico.

Onions are divided into sweet Spanish types whose bulbs grow to 3-5 inches in diameter and smaller storage types that are more pungent to the taste and are most often used for cooking. The bulbs of both Spanish and storage types are yellow, red or white.

Early onion production in Connecticut

Onions have been grown in Connecticut since colonial days. Wethersfield became the center of commercial production in the eighteenth century but gradually produced onions only for seed production. Onion production was especially 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 types. As early as 1879 The Connecticut Agricultural Experiment Station reported the results of germination tests for Wethersfield Red (Annual Report 1879). Southport Yellow, Red, and White Globe were first reported by the Connecticut Board of Agriculture in 1890 (Annual Report 1890). These varieties survive today.

Current outlook

The relatively recent rapid growth of the food service industry, which encompasses fast-food chains, restaurants, school and corporate cafeterias, and hospitals, has created a large demand, especially for Spanish onions, and a price advantage in late-summer and early-fall markets before western-grown onions are harvested in October. I therefore believe there is opportunity for Connecticut farmers to grow onions at a profit.

In 1990, 9 cultivars of Spanish and storage onions were grown from transplants, direct seeding, or sets at Valley Laboratory in Windsor and Lockwood Farm in Mt. Carmel. The trials in 1991 were expanded to 19 cultivars of Spanish and storage types. I report yields 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 yields by adding organic matter to reduce the density of heavy loam soils are also discussed.

METHODS AND MATERIALS

Soils

Onion trials were conducted at Valley Laboratory, Windsor on Merrimac sandy loam, a sandy terrace soil with somewhat limited moisture holding capacity, and at Lockwood Farm, Mt. Carmel on Cheshire fine sandy loam (1990), a well drained loamy upland soil and Watchaug loam (1991) a moderately well drained loamy upland soil with moderate moisture holding capacity.

Cultivars

Seeds and sets were obtained from several domestic seed suppliers. Cultivars included Spanish and storage types of yellow, red and white color. They are grouped as follows:

Yellow Spanish--Ailsa Craig, Gringo, Hybrid Big Mac, Ringmaker, Riverside, Valiant

Big Mac, Ringmaker, Riverside, Valiant
Red Spanish--Big Red Hybrid
White Spanish--White Sweet Spanish
Yellow Storage--Copper King, Copra, Early Yellow Globe, Norstar, Sweet Sandwich, Tamarack II, Wolverine
Red Storage--Carmen, Lucifer, Red Man, Southport Red Globe, Tango
Yellow Sets--Yellow Rock
Red Sets--Southport Red Globe
White Sets--Southport White Globe

Culture

Three rows of seed were sown March 1-6 in shallow plastic trays, 21 x 11 x 2.5 in., filled with Promix BX in a greenhouse maintained at 50-70 F. The seedlings were lightly thinned after reaching 1-1.5" in height to avoid overcrowding. Five-week-old seedlings were moved to a cold frame April 5-10 for hardening 10 days before planting in the field. Water soluble 20-20-20 fertilizer (1 Tbsp/gal) was added to the seedlings one week before transplanting. All seedlings were transplanted and sets and seeds directly planted April 20-May 10 at both sites. The seedlings were transplanted in paired 30-foot rows 12 in. apart with 24 in. spacing between cultivars. Spanish onions transplants were set 6 in. apart within rows; storage onion transplants were set 4 in. apart within rows. Direct seeded onions were thinned to 3 in. within rows. Onion sets were planted 3 in. apart within rows. In 1991, the crop was irrigated twice at Windsor and once at Mt. Carmel. In 1990, irrigation was unnecessary at both sites.

Fertilizer and amendments

In 1990, one inch of leaf mold was added to half the test area and incorporated with a rototiller. The soils were fertilized with 1200 lb/A 10-10-10 and limed to attain a pH of 6.5. The rows were side dressed with 90 lb/A ammonium nitrate at the 5-leaf stage. Total fertilization supplied about 150 lb N/A to the growing crop.

Weed control

Weeds were controlled by cultivation in 1990 and herbicides in 1991. Dacthal 75 W (10 lb/A) was applied immediately after transplanting and seeding. Weeds that emerged between transplanting and the 3-leaf stage growth of onions were controlled with Goal 1.6 E (3 oz/A).

Harvest and storage

When about half the plants toppled, the remaining ones were bent over. After the tops began to wither, the bulbs were uprooted and air dried for 7-10 days. After weighing all onions, 25 from each cultivar were randomly sampled, placed in wire baskets and stored at 34 F and 70% humidity for 16 or 19 weeks. They were checked at 4-week intervals for sprouting and decay. After 19 weeks, cold storage was terminated and the temperature rose to 75 F. After 3 weeks losses due to sprouting and decay were measured.

YIELDS-1990

Spanish onion transplants

The average yield of transplanted Spanish onions at Windsor was 1052 50-lb bags/A in compost-amended soil and 1183 50-lb bags/A in unamended soil (Table 1). The average weight/bulb in amended and unamended soils was 14.5 oz and 17.9 oz, respectively. The larger yields in unamended soil were due to heavier bulbs. Ringmaker produced higher yields than Riverside in both amended and unamended soil. Yield of both cultivars was well above the national average of 720 50-lb bags/A (USDA 1990).

At Mt. Carmel, the average yield of two cultivars of transplanted Spanish onions was 867 50-lb bags/A in compost-amended compared to 755 50-lb bags/A in unamended soil (Table 2). The average weight/bulb in amended soil was 12.1 oz compared to 10.4 oz in unamended soil, an increase of 16%. The larger yield in amended soil is attributed to heavier bulbs because loss of bulbs due to rotting was minimal for both treatments. Ringmaker produced heavier yield in compost-amended soil compared to unamended soil; Riverside yields were similar in both treatments. All yields were above the national average for both amended and unamended soil.

Storage onion transplants

At Windsor, the average yield of five cultivars of transplanted storage onions was 896 50-lb bags/A in compost-amended soil compared to 908 50-lb bags/A in unamended soil (Table 1), again well above the national average. The average weight/bulb in compost-amended soil was 9.0 oz compared to 9.1 oz in unamended soil, a 1% difference. Although the average yield of all cultivars was similar, the yield of Copra and Sweet Sandwich increased 20% in compost-amended soil compared to their yield in unamended soil. Among all storage types, yields of Tamarack II was greatest in amended and unamended soil. Most bulbs from transplants exceeded 3 in. diameter and were graded Large. Losses due to rotting in the field were 0-15%.

At Mt. Carmel the average yield of five cultivars

unamended soil (Table 2). The average weight/bulb in compost-amended soil was 6.2 oz compared to 5.5 oz in unamended soil, an increase of 13%. All cultivars produced heavier bulbs in compost-amended soil. Among the cultivars, Sweet Sandwich had the greatest yield in compost amended soil; Carmen, in unamended soil. Most bulbs from transplants exceeded 2.5 in. diameter and were graded Medium; less than 5% of the bulbs rotted in the field.

Direct seeding

At Windsor, the average yield of five cultivars of direct seeded storage onions was 229 50-lb bags/A in compost amended soil compared to 386 50-lb bags/A in unamended soil, a decrease of 68% (Table 1). The lower yield of direct seeded onions was due to smaller sizes compared to onions produced from transplants. The 6-week earlier start in the greenhouse produced larger plants that formed larger bulbs during the

Table 1--Yield of Spanish and storage onions grown from transplants, direct seeding and sets at Windsor, 1990.

	Harvested %		Avg bulb wt. oz		50-lb Bag* No./A	
	Compost added	No compost	Compost added	No compost	Compost added	No compost
TRANSPLANTS--SPANISH TYPES						
Ringmaker	100	92	16.1	19.0	1169	1269
Riverside	100	90	12.9	16.8	936	1097
Avg.	100	91	14.5	17.9	1052	1183
TRANSPLANTS--STORAGE TYPES						
Copra	96	100	9.2	7.3	961	795
Sweet Sandwich	87	95	10.5	8.0	995	827
Tamarack II	99	99	9.9	11.4	1067	1229
Southport Red	82	83	7.9	10.5	705	949
Carmen	92	81	7.5	8.4	751	741
Avg.	91	92	9.0	9.1	896	908
DIRECT SEEDED--STORAGE TYPES						
Copra	100	100	1.4	2.5	203	363
Sweet Sandwich	100	100	2.9	3.7	421	537
Tamarack II	100	100	1.6	2.8	273	406
Southport Red	100	100	1.0	2.3	145	334
Carmen	100	100	1.0	2.0	145	290
Avg.	100	100	1.6	2.7	229	386
SETS						
Yellow Rock	76	90	6.4	6.7	706	876
Southport White	91	92	5.6	5.6	740	748
Southport Red	89	90	4.8	4.4	620	575
Avg.	85	91	5.6	5.5	689	733

* Based on: 58,080plants/A for transplants, Spanish types (6" x 18").
87,120plants/A for transplants, Storage types (4" x 18").
116,160 plants/A for direct seeded and sets (3" x 18").

summer. Bulbs of direct seeded onions began to form in late summer and failed to attain large size. Most direct seeded storage onions were graded Small (1-2 in.). Among direct seeded storage types, Sweet Sandwich had the heaviest bulbs in both compost-amended and unamended soil.

At Mt. Carmel, the average yield of five direct seeded storage onions was 127 50-lb bags/A in compost-amended soil compared to 128 50-lb bags/A in unamended soil (Table 2). The average weight/bulb in compost amended and unamended soil was 0.9 oz. Direct seeded Sweet Sandwich produced the largest yield in compost-amended soil. As in Windsor, the lower yield of direct seeded onions compared to transplanted onions is due to lower bulb weight caused by late initiation of bulbing.

Table 2--Yield of Spanish and storage onions grown from transplants, direct seeding and sets at Mt. Carmel, 1990.

	Harvested %		Avg bulb wt. oz		50-lb Bag* No./A	
	Compost added	No compost	Compost added	No compost	Compost added	No compost
TRANSPLANTS--SPANISH TYPES						
Ringmaker	100	100	13.4	10.2	973	740
Riverside	98	100	10.7	10.6	761	770
Avg.	99	100	12.0	10.4	867	755
TRANSPLANTS--STORAGE TYPES						
Copra	100	100	5.1	4.6	555	501
Sweet Sandwich	97	99	7.2	5.8	761	625
Tamarack II	100	100	6.2	5.1	675	555
Southport Red	97	96	6.3	5.8	665	606
Carmen	97	99	6.4	6.2	676	668
Avg.	98	99	6.2	5.5	666	591
DIRECT SEEDED--STORAGE TYPES						
Copra	100	100	0.8	1.0	116	145
Sweet Sandwich	100	100	1.2	1.0	174	145
Tamarack II	100	100	0.5	1.0	72	145
Southport Red	100	100	0.9	0.8	130	116
Carmen	100	100	1.0	0.6	145	87
Avg.	100	100	0.9	0.9	127	128
SETS						
Yellow Rock	83	85	5.6	5.1	675	629
Southport White	96	94	4.8	4.2	669	573
Southport Red	92	88	3.5	3.4	468	434
Avg.	90	89	4.6	4.2	604	545

* Based on: 58,080plants/A for transplants, Spanish types (6" x 18").
87,120plants/A for transplants, Storage types (4" x 18").
116,160 plants/A for direct seeded and sets (3" x 18").

Onion sets

At Windsor, the average yield of three cultivars of onion sets was 689 50-lb bags/A in compost-amended soil compared to 733 50-lb bags/A in unamended soil (Table 1). The weight/bulb of Yellow Rock exceeded 6.4 oz in compost-amended and unamended soil, but yield/A in compost-amended soil was reduced 24% mostly due to rotting. About 30% of Southport White Globe had reduced quality from splitting of the bulb to form double centers compared to 5 to 10% of other sets. Yields of Yellow Rock and Southport White Globe were above the national average in both compost-amended and unamended soil.

At Mt. Carmel the average yield of three cultivars of onion sets was 604 50-lb bags/A in compost-amended soil compared to 545 50-lb bags/A in unamended soil, an increase of 11% (Table 2). The weight/bulb of Yellow Rock exceeded 5.0 oz in compost-amended and unamended soil. About 5-15% of bulbs grown from sets rotted in the field. In addition, 8-14% of Southport White Globe bulbs had double centers compared to less than 2% in other cultivars produced from sets.

Effect of compost amendment

From Table 1, it is obvious that onion yields in the sandy soil at Windsor did not benefit from the addition of compost. Lower yields in the compost-amended soil were due to decreased bulb weight; the average percent of all bulbs harvested was similar in compost-amended and unamended soil.

From Table 2, it is apparent that Spanish and storage bulbs produced from transplants and sets at Mt. Carmel benefited from addition of compost, while those produced from direct seeding did not benefit. Yield of most cultivars increased 10 to 30%. The addition of compost to Cheshire fine sandy loam, rich in silt and clay, reduced its density and provided a better growth medium for bulb growth.

The effect of soil type on yield of onions is pronounced. From Tables 1 and 2 we observe that average yield at Windsor compared to Mt. Carmel on unamended soil is 57% greater for transplanted Spanish onions, 54% greater for transplanted storage onions, 300% greater for direct seeded onions, and 34% greater for onions from sets. The lighter Merrimac sandy loam produced larger bulbs than the heavier Cheshire fine sandy loam. This is not surprising in view of the fact that onion production in New York State is mostly on drained peat soils which offer little resistance to bulb formation. Although addition of organic matter increased yield on heavier loamy soils, it did not increase the yield on lighter sandy soil.

YIELDS-1991

Spanish onion transplants

Compost was not added in 1991, therefore, all yields reported are for unamended soil. Onion sets were not used in 1991. At Windsor, the average yield of all transplanted Spanish onion cultivars was 610 50-lb bags/A compared to 112 50-lb bags/A at Mt. Carmel (Table 3). The crop at Mt. Carmel, planted in Watchaug loam, a moderately well drained loamy upland soil, grew poorly during June when average rainfall was one inch below normal. The vegetative growth slowed during this droughty month and the stunted plants did not form normal sized bulbs in July and August. Most bulbs were 1-2 inches diameter and were graded Small. Although the average yield of transplanted Spanish onions at Windsor was 5-fold greater than at Mt. Carmel, it was 47% less than in 1990, a year of ample rain throughout the growing season. The yields of Gringo and Hybrid Big Mac exceeded 800 50-lb bags/A, well above the national average. The average weight/bulb for these cultivars was 15.6 oz and 13.1 oz, respectively. Most bulbs were greater than 3 inches diameter and were graded Large. In the produce industry most of the large bulbs would be graded Jumbo (3-4 inches) with about 5% as Colossal (greater than 4 inches). Yield of Ailsa Craig exceeded the national average and Ringmaker and Valiant were slightly below the national average. The yield of Spanish onions at Windsor was diminished by 15-30% rotting in the field. The yield was further diminished for Big Red and White Sweet Spanish by very rapid resprouting during curing in the field. At Mt. Carmel low yields were due to the predominance of small bulbs and were accentuated by rotting and resprouting in the field during curing.

Storage onion transplants

At Windsor, the average yield of all transplanted storage types was 501 50-lb bags/A compared to 185 50-lb bags/A at Mt. Carmel (Table 3). The average yield at Windsor, although 3-fold greater than at Mt. Carmel, was 45% less than yields in 1990, again due to insufficient rain in June. The yields of Early Yellow Globe and Wolverine exceeded 600 50-lb bags/A with greater than 60% of bulbs graded as Medium. In most other cultivars, only 40-50% were Medium. Norstar produced 75% medium sized onions, but the yield was diminished by 46% sprouting in the field during curing.

Among the red onions, yield of Red Man and Tango exceeded 450 50-lb bags/A. They were evenly divided between Medium and Small sizes.

Table 3--Yield of Spanish and storage onions grown from transplants and direct seeding at Windsor and Mt. Carmel, 1991.

	Windsor			Mt. Carmel		
	Hvst. %	Bulb oz	50 lb bags/A*	Hvst. %	Bulb oz	50 lb Bags/A*
TRANSPLANTS--SPANISH TYPES						
Ailsa Craig	80	13.2	767	-	-	-
Gringo	82	15.6	929	41	4.2	125
Hybrid Big Mac	84	13.1	799	46	3.3	110
Ringmaker	72	12.6	659	47	4.2	143
Riverside	72	9.9	517	43	2.8	87
Valiant	70	12.2	620	53	3.3	129
Big Red	30	9.8	213	42	2.7	82
White Sweet Sandwich	50	10.5	381	-	-	-
Avg.	68	12.1	610	45	3.4	112
TRANSPLANTS--STORAGE TYPES						
Copper King	74	7.1	572	43	3.2	150
Copra	73	6.0	477	59	2.9	186
Early Yellow Globe	74	8.1	653	68	3.2	237
Norstar	54	7.1	418	68	3.6	267
Sweet Sandwich	-	-	-	57	2.6	161
Tamarack II	88	5.6	537	46	2.9	145
Wolverine	90	6.2	608	70	3.0	228
Carmen	63	5.9	405	49	2.7	144
Lucifer	67	6.2	452	57	2.8	174
Red Man	71	6.0	464	57	2.6	161
Tango	67	5.8	423	-	-	-
Avg.	72	6.4	501	57	3.0	185
DIRECT SEEDED--STORAGE TYPES						
Copper King	100	1.9	276	-	-	-
Copra	100	1.8	261	-	-	-
Early Yellow Globe	100	3.0	436	-	-	-
Norstar	100	2.7	392	-	-	-
Wolverine	100	2.5	363	-	-	-
Lucifer	100	2.8	406	-	-	-
Red Man	100	2.8	406	-	-	-
Tango	100	3.0	436	-	-	-
Avg.	100	2.6	372			

* Based on: 58,080 plants/A for transplanted Spanish types (6" x 18").
87,120 plants/A for transplanted storage types (4" x 18").
116,160 plants/A for direct seeded (3" x 18").

At Mt. Carmel, although the yield of Early Yellow Globe, Norstar and Wolverine exceeded 225 50-lb bags/A, it was well under the national average (Table 3). The higher yield of these cultivars, compared to others, was largely due to a greater percentage of harvest and slightly greater bulb weight.

Direct seeded storage onions

At Windsor, the average yield of direct seeded onions was 372 50-lb bags/A (Table 3). The average yield in 1991 was 4% less than in 1990 and was less affected by June drought than transplanted onions. The greatest yields were from Early Yellow Globe and Tango, a red cultivar. In these two cultivars, bulb weight was greatest, with 60% graded Medium size. In the remaining cultivars, most bulbs were Small.

Direct seeded storage onions at Mt. Carmel germinated poorly; no yield information was available.

STORAGE DURABILITY

Stored onions are the mainstay of winter and early spring sales. Under proper conditions some onions can be stored nearly a year. Losses reported here are mostly from sprouting. Rotting of bulbs was less than 1% of the total number stored. After 19 weeks cold storage, loss of Spanish onions from transplants was very small. Ailsa Craig, Ringmaker and Big Red lost less than 5%. Following 3 weeks at room temperature, the bulbs of most cultivars sprouted readily. For Valiant and Riverside, however, 84% and 76% of bulbs did not sprout. Virtually all bulbs of Ailsa Craig and White Sweet Sandwich sprouted soon after exposure to room temperature. Nearly half the bulbs sprouted in the remaining cultivars.

Among the transplanted storage types, 16-24 percent of Copper King, Carmen and Tango sprouted in cold storage after 16 weeks. No bulbs sprouted in Copra, Tamarack II, Wolverine and Lucifer. After 3 weeks storage at room temperature, greater than 70% of bulbs sprouted in Copper King, Norstar, Carmen, Lucifer, Red Man and Tango. Less that 10% of bulbs sprouted in Copra and Wolverine.

Among the direct seeded storage types, less than 10% of bulbs of Copper King, Norstar, Red Man and Tango sprouted after 16 weeks of cold storage. After 3 weeks at room temperature, 60-70% of Copper King, Early Yellow Globe, Norstar and Tango sprouted. Less than 5% of Copra, Tamarack II and Wolverine sprouted. Sprouted bulbs of transplanted storage types averaged 56% compared to 38% for bulbs of direct seeded storage types. The larger bulbs of transplanted onions were more prone to sprouting than the smaller bulbs of direct seeded onions.

Table 4--Storage losses of Spanish and storage onions stored at 34 F and 70% relative humidity for 16 or 19 weeks and then at 70 F for 3 weeks.

	34 F	70 F
	%	%
TRANSPLANTS--SPANISH TYPES		
	19 wks	3 wks
Ailsa Craig	4	92
Gringo	0	48
Hybrid Big Mac	0	44
Ringmaker	4	44
Riverside	0	24
Valiant	0	16
Big Red	4	48
White Sweet Sandwich	0	96
TRANSPLANTS--STORAGE TYPES		
	16 wks	3 wks
Copper King	16	92
Copra	0	8
Early Yellow Globe	8	40
Norstar	8	68
Tamarack II	0	20
Wolverine	0	8
Carmen	16	88
Lucifer	0	68
Red Man	8	72
Tango	24	92
DIRECT SEEDED--STORAGE TYPES		
	16 wks	3 wks
Copper King	8	60
Copra	0	4
Early Yellow Globe	0	68
Norstar	8	68
Tamarack II	0	0
Wolverine	0	4
Lucifer	0	44
Red Man	4	28
Tango	8	68

MANAGEMENT STRATEGIES

Selection of Cultivars

Because onions are harvested all at once, most are stored for future winter or spring sales. Thus,

selection of cultivars is based not only on yield, but durability under protracted cold storage and return to room temperature. Among the yellow Spanish onions, grown from transplants, Gringo, Hybrid Big Mac and Ringmaker provided the greatest yields and are best suited for fall and early winter sales because losses after 2 to 3 months were excessive. Valiant and Riverside, with lowest yield among the yellow cultivars, had less than 25% loss in storage after 2 to 3 months. The yields of the red and white cultivars were low and losses at room temperature following cold storage were excessive. Among the yellow storage onions grown from transplants, the yields of Copra, Early Yellow Globe, Tamarack and Wolverine were greatest and storage losses were low except for Early Yellow Globe. The latter would be best suited for fall sales. Among the red cultivars, Red Man and Lucifer had the greatest yields, but losses in storage after 3 to 4 months were excessive.

The yield of all cultivars of direct seeded storage onions was low in comparison to transplanted onions. Copra, Tamarack II, and Wolverine had low storage losses after 19 weeks.

Although the yield of onions grown from sets was near the national average, the quality was poor because of excessive numbers of bulbs with double centers, especially Southport White Globe.

Site selection and organic matter amendments

The data from 2 years of onion trials suggests that light sandy loam soils consistently produce greater yields than heavier loamy soils. On sandy soils, yield of onions was greater regardless if they were grown from transplants, sets or direct seeded. Although the yield of many cultivars in loamy soils was improved 10 to 15% by the addition of 1 inch of leaf-mold, they seldom reached the national average of 720 50 lb bags/A. Additional annual applications of leaf-mold in heavy soils to further reduce their density might provide additional benefit.

Fertilization and irrigation

Maximum yield of onions requires optimum nitrogen and moisture supplies, especially during formation of bulbs which begins when day length reaches 15 hours for long-day cultivars (Splittstoesser 1979). Because plants begin to form bulbs regardless of their size when day length reaches 15 hours, larger plants produced larger bulbs. Initial preplant application of 1200 lb/A 10-10-10 fertilizer (120 lb N/A) followed by side dressing with 90 lb/A ammonium nitrate (30 lb N/A at the 5-leaf stage in June) should supply adequate nitrogen. Onions should also receive at least 1 inch of water each week from rainfall or irrigation from transplanting through the completion of bulb formation.

Harvest and Storage

Mature bulbs were harvested and field dried for about 10 days. Preferably they should be protected from the sun to prevent scalding. If left in the field too long, cultivars with a short dormancy period may sprout in the field before storage. Alternatively, anti-sprouting agents, such as maleic hydrazide, (MH-30) can be sprayed on the crop a few days before harvest when the plants are still green. An application of 2-3 lb/A of MH-30 has been shown to effectively prevent sprouting in storage (Yamaguchi 1983). Bulbs should be stored at 34 F and a relative humidity of 50-70% to maintain dormancy.

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