THE UNIVERSITY OF GEORGIA
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Colleges of Agricultural and Environmental Sciences & Family and Consumer Sciences

White Clover Variety Trials 2004-2009

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Introduction to White Clover

Adaptation:	Entire state. Excellent reseeding potential. Perenniates 2-3 yrs on loamy to clayey soils north of the Fall Line. Can perenniate (or reseed) in Coastal Plain on wet soils or well irrigated pastures. Tolerant of moderate soil acidity and wetter soils. Grows best with cool season perennial grasses.
Establishment:	Broadcast or drill at 2 - 3 lb/A in October-November or February-March.
Recommended Varieties:	North GA – Durana or Patriot South GA – Durana, Patriot, or (for short duration production) Osceola or Louisiana S-1

White clover (*Trifolium repens*)

White clover is one of the most widely-grown forage legume crops in the world. It is adapted to a wide range of soils and climates and is grown for forage from Florida to the northeastern United States. White clover is a relatively low growing legume that spreads by stolons and can tolerate close grazing. It furnishes grazing in fall, late winter, and spring. Yields of white clover are usually not sufficient for it to be grown alone or in a hay crop, but it contributes a substantial amount of high quality forage when produced with cool season perennial grasses, such as tall fescue. White clover is also compatible with some bermudagrass varieties, when grown in pastures.

White clover grows best on moist soils and can die during hot, dry summers. However, some new varieties of white clover are more persistent and will either survive these conditions or return from seed. This legume is generally most productive on fertile soils along streams. In the upper Piedmont and Limestone Valley/Mountains region, white clover does well on upland soils.

There are three basic types of white clover: large (e.g., Ladino clover, 'Patriot,' 'Regal'), intermediate (e.g., 'Durana,' 'Osceola'), and low growing (e.g., Dutch clover). Large or ladino types are higher yielding than other types, but they do not reseed as well as the other types and are generally more short-lived.

The intermediate types are well-adapted to most sites throughout Georgia. They are prolific reseeders and may act as annual plants in south Georgia. Some improved intermediate white clovers are exceptionally tolerant of grazing and persist very well, even in some drought-prone and infertile sites.

Low-growing types are commonly seen growing on roadsides and in yards. Although they also are prolific reseeders, they are not planted for forage because of low yields and a poor ability to compete with grasses.

Description of the Variety Trials

White clover variety entries were solicited from the companies who sell them. These companies were charged an entry fee for each variety they entered and for each location in which the variety was tested. This entry fee helped to cover some of the costs of the variety trial.

The tests were planted at Georgia Agriculture Experiment Station (GAES) facilities and maintained by experienced research technicians and other GAES staff under the supervision of the State Forage Extension Specialist. The white clover trials were established and managed using standard practices as recommended by UGA Specialists. Unless otherwise indicated, the trials were established by drilling the white clover seed into a well-prepared seedbed at the rate of 3 lbs of pure live seed (PLS) per acre. Specific planting dates for individual locations are described in the Yield by Harvest Date sections. Soil fertility was maintained in accordance with soil fertility recommendations.

Two types of variety trials were conducted. The first type is the yield trial. Yield-type variety trials simulate forage productivity under a well-managed rotational grazing regimen. The tests generally continued for at least three years. Tables that indicate a summary of data from 2008 through 2009 will be continued in 2010. Tests are only ended before three years when the stands of the majority of the entries deteriorate below 60% basal area coverage (60% stand). If the variety trial failed to maintain this threshold for the three years because of stand deterioration, a footnote is added to describe when and why the study was terminated. Yield trials conducted after 2006 were assessed annually for stand persistence in a manner similar to that described for the grazing persistence trials below.

The second type of variety trial is the grazing persistence trial. In this trial type, white clover varieties were planted and managed similar to the yield trials. Once the stand was well-established (i.e., stands exhibited stoloniferous spread), however, the plots were subjected to continuous grazing pressure by mature beef cows during the growing season of the three years of the trial. The result of this grazing pressure was a simulation of severe over-grazing. Stands were assessed using a quantitative measure of the plot area that is covered by living white clover plants after harvest (basal area coverage). This stand assessment usually was made during the dormant season (winter).

Statistical analyses were performed on all data to determine if the numerical differences were truly the result of varietal differences or just random differences. To determine if two varieties are truly different, compare the difference between them and the LSD (Least Significant Difference) at the bottom of the column. If the difference is equal to or greater than the LSD, the varieties are truly different when grown under the conditions at the given locations. The comparison is aided by the fact that the values in bold font are not significantly different from the best variety at that time and location. In addition, values sharing the same letter are not different. NS indicates no significant differences were observed. The Coefficient of Variation (CV) is a measure of the variability of the data and is included for each column of means when differences exist. Low variability is desirable (generally, a CV less than 15%).

White Clover Yield Trial Summary

Table 1. Forage yield of white clover varieties averaged over the 2005- 2006 growing seasons in Blairsville and 2004- 2006 growing seasons and the 2009 growing season in Athens, GA.[†]

	Blairsville	Athens	
Variety	2-yr Average (2005-06)	3-yr Average (2004-06)	1-yr Average (2009)
	---------- dry lbs/acre----------		
AGR TR 217[§]	5192 abc[‡]	2740 bc	
Barblanca	-	-	3870 abcde
CW 0401[§]	-	-	4809 a
CW 190[§]	3804 e	3155 ab	
CW 204[§]	-	-	4161 abc
CW 9502[§]	5044 abc	2693 c	-
CW 9701[§]	5193 abc	3496 a	-
Durana	4762 bcd	2622 cd	-
FWC C5[§]	-	2111 ef	-
GA 211-57[§]	5381 abc	2862 bc	-
GA 211-58[§]	4662 cd	1713 f	-
GA 211-60[§]	4223 de	2221 de	-
GA Eat x B. loam[§]	5562 a	2743 bc	-
GA Eat X Demand[§]	4170 de	-	-
Ga. Tift X Osceola[§]	3663 e	2586 cd	-
Huia	4188 de	-	-
Ivory II	-	-	3409 bcdefg
Kopu II	-	-	2658 fghi
Kotare	-	-	3125 cdefgh
Osceola	4184 de	2686 c	-
Patriot	5416 ab	2970 bc	4017 abcd
Regal	-	-	4471 ab
Regalgraze	-	-	3911 abcde
Sustain	-	-	1905 i
Tripoli	-	-	2250 hi
TRxA 101[§]	-	-	3785 abcdef
TRxA 102[§]	-	-	2169 hi
TRxA 103[§]	-	-	2761 efghi
TRxA 104[§]	-	-	2631 ghi
Weka	-	-	2947 defghi
CV %	18	22	25
$LSD_{\alpha=0.05}$	736	430	1152

[†] Planted in Blairsville on April 21, 2004; in Athens (2004-2006) on October 1, 2003; and in Athens (2009) on October 10, 2007. Note: severe drought resulted in no harvestable yield in 2008. Stand assessments (basal cover estimates) were not made on trials prior to 2007.

[‡] Values within a column that are labeled with the same letter were not significantly different (α=0.05) from one another. Values that are in **bold** font are not significantly different from the best variety at that time.

[§] Experimental variety (not available).

Stand Assessments (Yield Trial) – Athens

Table 2. Percent basal cover of white clover varieties in the yield trial located at Athens, GA. 2009.[†]

Variety	Percent basal cover within row Dec. 17, 2009
Barblanca	93 a[‡]
CW 0401[§]	92 a
Patriot	91 a
RegalGraze	86 a
CW 204[§]	80 ab
Weka	69 abc
TRxA 101[§]	67 abc
Kotare	66 abc
Ivory II	65 abc
Kopu II	57 bc
Regal	55 bc
TRxA 102[§]	51 cd
TRxA 103[§]	49 cd
Sustain	47 cd
TRxA 104[§]	44 cd
Tripoli	25 d
CV %	14
$LSD_{\alpha=0.05}$	14.1

[†] Planted on October 10, 2007. Note: severe drought resulted in no harvestable yield in 2008 and no stand assessment was made in 2008.

[‡] Values within a column that are labeled with the same letter were not significantly different (α=0.05) from one another. Values that are in **bold** font are not significantly different from the best variety at that time.

[§] Experimental variety (not available).

Stand Assessments (Grazing Trial) – Eatonton

Table 3. Percent basal cover of white clover varieties in the grazing persistence trial at Eatonton, GA. 2007-2009.[†]

Variety	Percent basal cover within row July 14, 2007	Jan. 4, 2008	Dec. 4, 2008
Durana	79	80 ab[‡]	43 a
CW 0401[§]	73	81 ab	43 a
Resolute	87	84 a	20 b
RegalGraze	78	75 ab	18 b
Pinnacle	76	69 bc	15 b
Crusade	75	81 ab	11 b
Regal	72	70 bc	11 b
Will	85	83 ab	9 b
Excel	73	78 ab	8 b
Rampart	64	59 c	7 b
CV %	-	14	79
$LSD_{\alpha=0.05}$	NS (.09)	14.1	18.7

[†] Planted: November 1, 2006.

[‡] Values within a column that are labeled with the same letter were not significantly different (α=0.05) from one another. Values that are in **bold** font are not significantly different from the best variety at that time.

[§] Experimental variety (not available).

Yield by Harvest Date – Blairsville

Table 4. Forage yield of white clover varieties at Blairsville, GA. 2005-2006.[†]

Year	Variety	Dry Matter Yield dry lbs/acre Harvest Date				
2005		April 28	June 8	July 20	Oct.10	Total
		dry lbs/acre				
	Osceola	1848 a[‡]	2576	1641	1310	7375 a
	GA 211-57[§]	1753 abc	2466	1534	1319	7072 ab
	Patriot	1434 bcd	2547	1494	1367	6842 abc
	GA Eat x B. loam[§]	1714 abc	2268	1571	1282	6835 abc
	RegalGraze	1530 ac	2505	1525	1266	6826 abc
	AGR TR 217[§]	1635 abc	2483	1468	1129	6715 abcd
	Huia	1087 de	2291	1763	1508	6649 abcd
	CW 9502[§]	1799 ab	2379	1219	1164	6561 abcde
	GA 211- 60[§]	1581 abc	1849	1215	1486	6131 bcde
	CW 190[§]	1402 cd	2160	1301	1214	6077 cde
	Durana	1441 bcd	2135	1194	1282	6052 bcd
	GA Eat x Demand[§]	1558 abc	1905	1224	1352	6039 cde
	GA 211-5 8[§]	1621 abc	1844	1228	1082	5775 de
	GA Tifton x Osceola[§]	881 e	1709	1528	1513	5631 e
	CV %	19				12
	$LSD_{\alpha=0.05}$	371	NS	NS	NS	987
2006		May 4	June 21			Total
	GA Eat x B. loam[§]	2539 a*	1750 ab			4289 a
	Patriot	2354 a	1636 ab			3990 a
	GA 211-57[§]	1872 ab	1818 a			3690 a
	AGR TR 217[§]	2280 a	1389 abc			3669 a
	GA 211-58[§]	2046 a	1504 abc			3550 a
	CW 9502[§]	2130 a	1396 abc			3526 a
	Durana	2177 a	1294 abc			3471 a
	GA 211- 60[§]	1223 bc	1091 cd			2314 b
	GA Eat x Demand	1005 cd	1295 abc			2300 b
	Huia	568 cd	1159 cd			1727 bc
	GA Tifton x Osceola[§]	644 cd	1051 cd			1695 bc
	CW 190[§]	337 d	1193 bcd			1530 bc
	Osceola	389 d	604 d			993 c
	CV %	37	35			30
	$LSD_{\alpha=0.05}$	725	590			1082

[†] Planted: April 21, 2004. Note: This yield trial ended after a drought during the summer of 2006 caused stand deterioration beyond acceptable thresholds for the experiment.

[‡] Values within a column that are labeled with the same letter were not significantly different (α=0.05) from one another. Values that are in **bold** font are not significantly different from the best variety at that time.

[§] Experimental variety (not available).

Yield by Harvest Date – Athens

Table 5a. Forage yield of White clover varieties at Athens, GA. 2004-2006.[†]

Year	Variety	Dry Matter Yield (dry lbs/acre) Harvest Date				
2004		May 4	June 8	July 28	Nov. 28	Total
		dry lbs/acre				
	CW 9701[§]	1367	1082	864 a[‡]	2104 a	5417 a
	CW 190[§]	1234	1468	568 b	1899 ab	5169 ab
	CW 9502[§]	909	1384	377 bc	1811 abc	4481 ab
	Ga 211-57[§]	1170	1378	201 cde	1674 abcd	4423 ab
	AGR TR 217[§]	1301	1278	195 cde	1542 abcde	4316 ab
	Ga Tifton x Osceola[§]	1443	1152	245 cde	1404 bcde	4243 b
	Ga Eat x B. loam[§]	934	1146	168 cde	1979 ab	4227 b
	Durana	1399	928	48 e	1799 abc	4174 bc
	Osceola	1113	1512	279 cd	1252 cde	4156 bc
	Patriot	1305	1174	249 cde	1414 bcde	4142 bc
	FWC C5[§]	1033	819	145 de	1058 e	3055 cd
	Ga 211-60[§]	850	724	78 de	1147 de	2799 d
	Ga 211-58[§]	838	657	73 de	1086 de	2654 d
	CV %			61	30	22
	$LSD_{\alpha=0.05}$	NS	NS (.08)	209	599	1137
2005		May 9	June 9			Total
	CW 9701[§]	2877 a	753 a			3630 a
	Patriot	2929 a	685 cd			3614 a
	Ga 211-60[§]	2686 ab	606 abc			3292 ab
	CW 190[§]	2362 bc	594 abc			2956 bc
	AGR TR 217[§]	2315 bc	607 abc			2922 bc
	Osceola	2318 bc	602 abc			2920 bc
	Ga Eat x B. loam[§]	2374 bc	461 bcd			2835 c
	Ga 211-57[§]	2408 bc	417 cd			2825 c
	CW 9502[§]	2139 bc	592 abc			2731 c
	Durana	2302 bcd	355 cd			2657 c
	FWC C5[§]	2045 cd	545 abc			2590 c
	Ga Tifton x Osceola[§]	2113 cd	413 cd			2526 cd
	Ga 211-58[§]	1893 b	270 d			2163 c
	CV %	14	38			12
	$LSD_{\alpha=0.05}$	432	255			445

[†] Planted: October 1, 2003. Note: No yields were taken in the fall of 2005 because of poor growing conditions. The yield measurements resumed in 2006 (see Table 5b).

[‡] Values within a column that are labeled with the same letter were not significantly different (α=0.05) from one another. Values that are in **bold** font are not significantly different from the best variety at that time.

[§] Experimental variety (not available).

Table 5b. Forage yield of white clover varieties at Athens, GA. 2004-2006 (cont'd).[†]

Year	Variety	Dry Matter Yield dry lbs/acre Harvest Date dry lbs/acre				
2006		May 4	June 8	July 28	Nov. 28	Total
	CW 9701[§]	1367	1082	864 a[‡]	2104 a	5417 a
	CW 190[§]	1234	1468	568 b	1899 ab	5169 ab
	CW 9502[§]	909	1384	377 bc	1811 abc	4481 ab
	Ga 211-57[§]	1170	1378	201 cde	1674 abcd	4423 ab
	AGR TR 217[§]	1301	1278	195 cde	1542 abcde	4316 ab
	Ga Tifton x Osceola[§]	1443	1152	245 cde	1404 bcde	4243 b
	Ga Eat x B. loam[§]	934	1146	168 cde	1979 ab	4227 b
	Durana	1399	928	48 e	1799 abc	4174 bc
	Osceola	1113	1512	279 cd	1252 cde	4156 bc
	Patriot	1305	1174	249 cde	1414 bcde	4142 bc
	FWC C5[§]	1033	819	145 de	1058 e	3055 cd
	Ga 211-60[§]	850	724	78 de	1147 de	2799 d
	Ga 211-58[§]	838	657	73 de	1086 de	2654 d
	CV %			61	30	22
	$LSD_{\alpha=0.05}$	NS	NS (.08)	209	599	1137

[†] Planted: October 1, 2003. Continued from Table 5a.
[‡] Values within a column that are labeled with the same letter were not significantly different (α=0.05) from one another. Values that are in **bold** font are not significantly different from the best variety at that time.
[§] Experimental variety (not available).

Table 6. Forage yield of white clover varieties at Athens, GA. 2009.[†]

Variety	Harvest Date dry lbs/acre			
	May 1	May 28	Nov. 16	Total
CW 0401[§]	1809 a[‡]	1067 a	1934 abc	4809 a
Regal	1734 a	577 bcdefg	2160 a	4471 ab
CW 204[§]	1428 abc	757 bc	1976 ab	4161 abc
Patriot	1747 a	613 bcde	1657 abcd	4017 abcd
Regalgraze	1552 ab	821 ab	1538 bcde	3911 abcde
Barblanca	1588 ab	690 bcd	1592 abcd	3870 abcde
TRxA 101[§]	1532 ab	604 bcdef	1649 abcd	3785 abcdef
Ivory II	1389 abcd	549 cdefg	1471 bcde	3409 bcdefg
Kotare	1418 abc	372 efgh	1335 cde	3125 cdefgh
Weka	1064 bcde	355 fgh	1528 bcde	2947 defghi
TRxA 103[§]	899 cde	380 efgh	1482 bcde	2761 efghi
Kopu II	926 cde	349 gh	1383 bcde	2658 fghi
TRxA 104[§]	761 e	441 defgh	1428 bcde	2631 ghi
Tripoli	821 de	382 efgh	1048 de	2250 hi
TRxA 102[§]	835 cde	403 efgh	930 e	2169 hi
Sustain	571 e	295 h	1039 de	1905 i
CV %	33	33	29	25
$LSD_{\alpha=0.05}$	595	253	621	1152

[†] Planted: October 10, 2007. Note: severe drought resulted in no harvestable yield in 2008.
[‡] Values within a column that are labeled with the same letter were not significantly different (α=0.05) from one another. Values that are in **bold** font are not significantly different from the best variety at that time.
[§] Experimental variety (not available).

Weather Data during Trials:

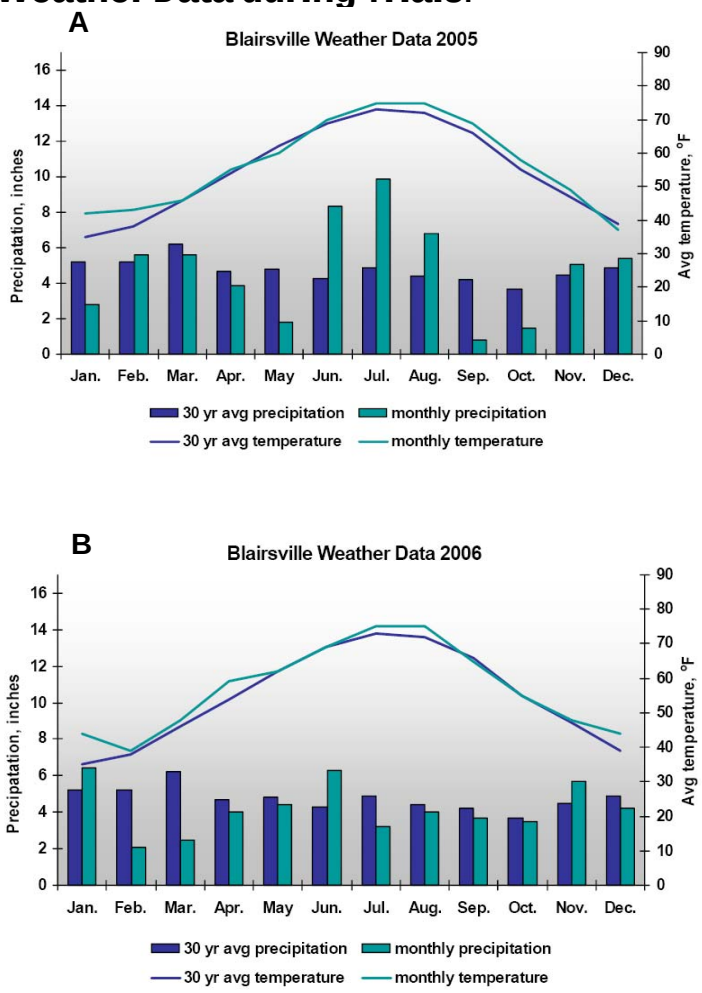

Figure 1. Weather data during the 2005 (A) and 2006 (B) growing seasons in Blairsville.

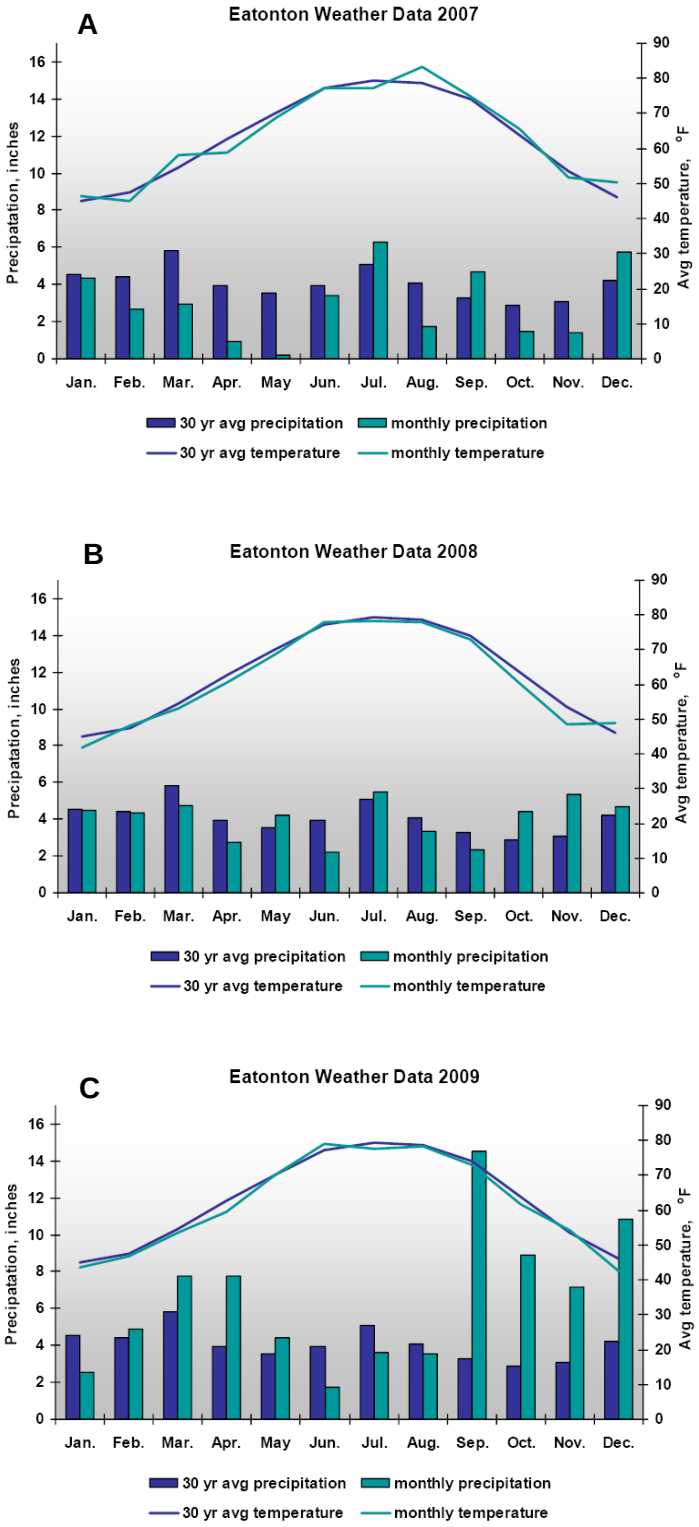

Figure 2. Weather data during the 2007 (A), 2008 (B), and 2009(C) growing seasons in in Eatonton.

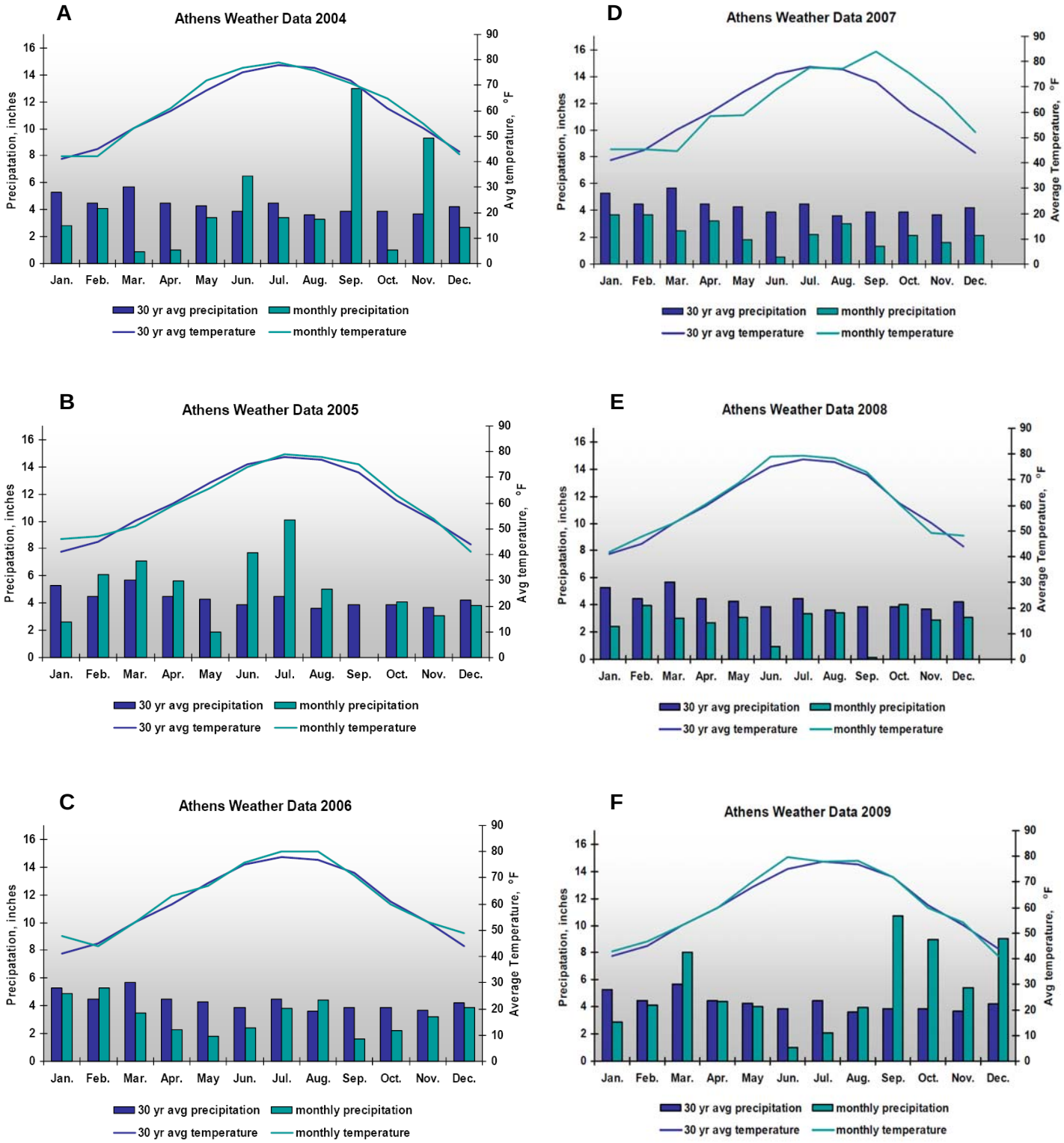

Figure 3. Weather data during the 2004 (A), 2005 (B), 2006 (C), 2007 (D), 2008 (E), and 2009 (F) growing seasons in Athens.

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