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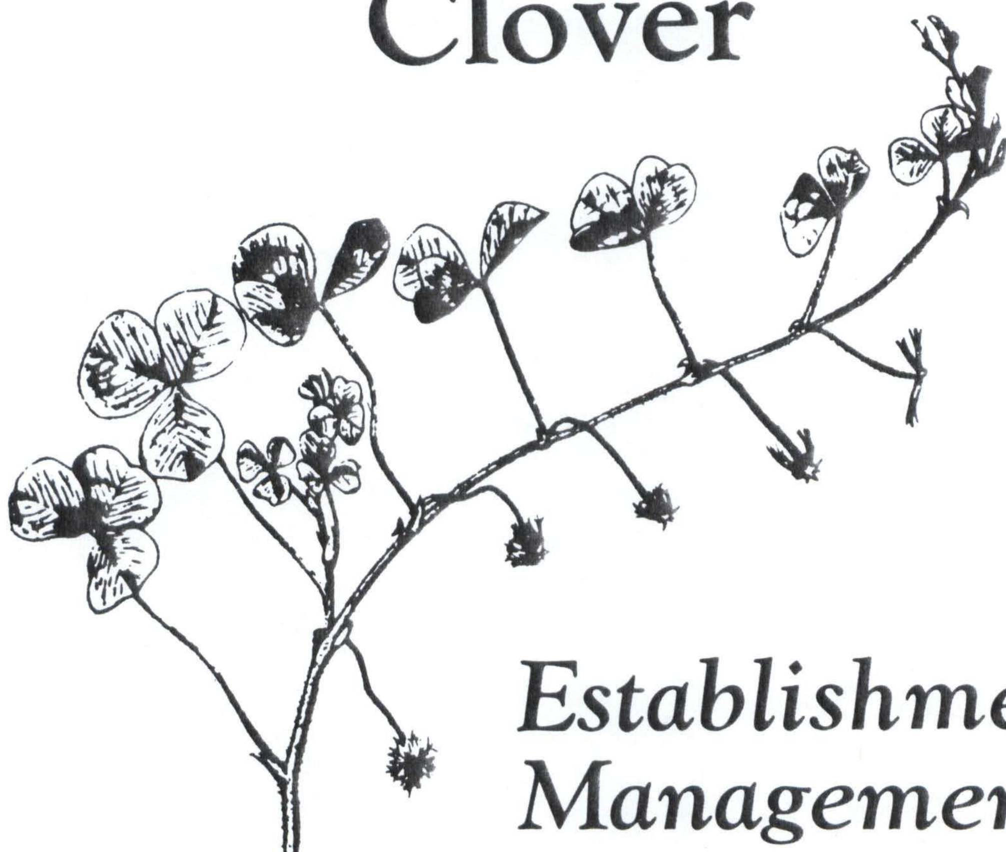
Subterranean Clover



Establishment, Management, and Utilization in Texas

THE TEXAS AGRICULTURAL EXPERIMENT STATION/Neville P. Clarke, Director/The Texas A&M University System/College Station, Texas

CHAPTER 2

Adaptation of Subterranean Clover to Calcareous Soils

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Susceptible crop and forage species exhibit symptoms of iron (Fe)- deficiency chlorosis when grown on high pH, high base status soils containing free calcium carbonate. Calcareous soils are widely distributed over the world's geographic regions, occurring predominantly in areas receiving less than 20 inches annual precipitation. In Texas, 80 percent of the soils in the western region of the state may be Fe deficient (1).

Iron-deficiency chlorosis is defined as an interveinal chlorosis of young leaves which regreens upon treatment with soluble Fe compounds, but does not respond to applications of nitrogen, sulfur, or other micronutrients (2). In subterranean clover, the first symptoms appear as a general yellowing of the youngest leaves. Retarded growth, formation of necrotic lesions, and discoloration of older leaves are common secondary symptoms (3).

In Australia, most subterranean clover varieties are not generally recommended for planting on calcareous soils (7,4). Clare and Koala are the only Australian varieties available that are suggested for calcareous soils. To date, this problem has not received much attention here in the United States, since subterranean clover has generally been grown on acid soils. However, as the range of subterranean clover in Texas has spread westward, Fe-deficiency chlorosis symptoms have appeared at a number of locations in this state. This discussion will focus on the differences among subterranean clover varieties in their apparent resistance to Fe-deficiency chlorosis in greenhouse and field studies conducted at Beeville and Yoakum.

Both greenhouse and field studies described herein utilized a visual chlorosis scoring system where 0 = no evidence of chlorosis and 4 or 5 = very severe chlorosis symptoms. We have observed, in field studies, that chlorosis symptoms of susceptible varieties may be quite severe during wet, cold weather, but may disappear altogether during drier, warmer periods. For greenhouse studies, we utilize high soil moisture conditions (near saturation) to induce the chlorosis symptoms on individual plants of a particular line. Table 1 shows how several commercially available subterranean clover varieties scored under greenhouse conditions at Beeville, compared to field chlorosis scores taken on January 8, 1987 at Yoakum. Despite differences in soil series and individual scorers, the rankings are quite similar between the two studies for differences in susceptibility between varieties.

While differences among these varieties are apparent for their expression of iron-deficiency chlorosis symptoms, its questionable as to whether this susceptibility translates into a yield depression. Yield trials during the past two growing seasons have been conducted on acid, near-neutral, and alkaline soil sites at Brenham, Beeville, and Yoakum (Table 2). Koala outyielded all other varieties at Brenham, with no significant differences between Clare and Mt. Barker on this high pH site. Clare has consistently had high yields on calcareous and near neutral soils at Beeville (5,6). Meteora has been a fairly successful cultivar on near-neutral sites at Beeville in past trials (5). This past year, Clare and Koala were among the leading subterranean clover varieties tested.

At Yoakum, Koala, Meteora, and Clare yielded most on the calcareous site in 1987. Trikkala, Larisa, and Koala outyielded all other varieties on Yoakum's acid site this past growing season, with Clare showing only mediocre performance. Karridale, which had the highest chlorosis score in greenhouse and field ratings, performed very well on the near-neutral and acid sites at Beeville and Yoakum, respectively. On the high pH soil in Brenham and Yoakum, it ranked well below the leading varieties.

At present, our knowledge of the problem of iron-deficiency chlorosis and potential losses in productivity that might be seen in susceptible subterranean clover varieties is somewhat limited. Mt. Barker and Woogenellup, the two most widely utilized varieties in Texas, both show symptoms of iron- deficiency chlorosis when grown in calcareous soils under greenhouse and field conditions.

Table 1. Chlorosis Scores of Subterranean Clover Varieties Under Greenhouse and Field Conditions, 1987

Variety	Greenhouse (Beeville) pH = 7.8	Field (Yoakum) pH = 7.8
	Score*	
Karridale	2.1a	2.8a
Nungarin	—	2.3ab
Tallarook	2.0a	—
Mississippi Ecotype	1.9a	—
Nangeela	1.9a	—
Mt. Barker	1.5b	1.5b
Woogenellup	0.9c	1.8b
Meteora	0.7cd	0.8c
Larisa	0.6d	0.8c
Esperance	—	0.5c
Koala	0.0e	0.0d
Clare	0.0e	0.0d
Trikkala	—	0.0d

*0.0 = no chlorosis, 5.0 = severe chlorosis. Means within columns followed by the same letter are not significantly different ($P<0.05$), according to Duncan's Multiple Range Test.

Table 2. Total Dry Matter Yields of Subterranean Clover Varieties at Brenham, Beeville, and Yoakum on Different pH Soils, 1985-86 and 1986-87

	Brenham[1]	Beeville		Yoakum	
Variety	1987 pH = 7.8	1986 pH = 8.1	1987 pH = 7.2	1987 pH = 7.8	1987 pH = 6.0
	Pounds/Acre				
Clare	4,515b*	4,079a	3,969ab	4,117ab	2,856ab
Karridale	3,721c	—	3,861ab	3,280cd	3,384a
Koala	5,757a	—	3,721ab	4,604a	3,799a
Woogenellup	—	3,268b	3,162bc	3,567bc	2,993ab
Mt. Barker	4,447b	3,174b	3,125bc	3,642bc	2,968ab
Larisa	—	2,293c	3,087bc	3,675bc	3,674a
Meteora	—	2,265c	2,243c	4,263ab	2,850ab
Trikkala	—	—	—	3,744bc	3,848a
Nangeela	—	1,897c	3,202bc	2,699d	2,860ab
Esperance	—	—	—	2,778d	2,333bc
Nungarin	—	—	—	887e	1,767c

[1]G. W. Evers, Angleton.

*Means within columns followed by the same letter are not significantly different ($P<0.05$).

Clare and Koala do not show chlorosis and have been performing well. Trikkala and Meteora are two other varieties that show only slight chlorosis and may deserve more attention at some locations.

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