Change in soil nitrogen under established swards of Caucasian clover

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Caucasian clover (Trifolium ambiguum) is a temperate, summer growing, perennial species which can grow from sea level up to relatively high (1200 m) elevations (1). It develops deep tap roots which may contribute towards the high level of drought tolerance exhibited by this species compared to T. repens which frequently dies out due to summer droughts even at high elevations (1).

Initially, nodulation and nitrogen(N) fixation was poor, however, identification of superior rhizobial strains (2) has allowed the development of much more effective symbiosis. A study in Tasmania (3) estimated that Caucasian clover was fixing up to 223 kg N/ha/yr. This paper reports the long term soil N buildup under a number of caucasian clover cultivars planted ten years previously.

Methods

In 1976, thirteen lines of Caucasian clover with representatives of each of the three ploidal groups were set out as spaced plants at Round Plain, elevation 1150 m. Each treatment was replicated 3 times. Full experimental details are given by Dear and Zorin (1). Ten years later in January 1986, 15 soil cores 2.5 dia x 10 cm deep were taken from selected plots so that at least one cultivar from each ploidal group was sampled. In November of that year, herbage production was also measured using a pasture capacitance probe.

Results and Discussion.

Over the ten year period there were substantial increases in the available N and total N levels of the soil compared to plots containing no legume.

Cultivar	Ploidal Group	Total Mineral N ppm	Total N %	Organic Carbon %	Available Herbage kg DM/Ha
Forest	Diploid	51.0	0.230	2.48	2809
Alpine	Diploid	30.8	0.230	2.52	2127
Treeline	Tetraploid	44.8	0.229	2.38	1696
Monaro	Hexaploid	41.5	0.236	2.40	2482
Control	-	10.6	0.182	2.01	399
S.E.D.	-	5.06	0.008	0.23	234

The change in total soil N levels in the top 10 cm (bulk density 1.3) indicated that the net increase in soil N averaged 60-70 kg N/ha/yr. This increase suggests a very effective and long lived symbiosis especially when the very short growing period is considered. Cold winters and dry summers usually restrict growth to the period September to December and March to May. The herbage figures, which represent growth for the 3 month period to mid December, show the significant impact this species has on pasture productivity when compared to the control plot consisting of native grasses.

1. Dear, B.S. and Zorin, M. 1985. Aust. J. Exp. Agric. 25 124-32.

2. Zorin, M, Dear,B.S and Hely, F.W. 1976. Field Stat. Record. 15 35-40.

3. Lane, P.A. 1985. Proc. 3rd Aust. Agron. Conf. Hobart. 211