

Application of PastureProbe™ in determination of herbage mass of subterranean clover

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ABSTRACT

PastureProbe™, a pasture-measuring instrument, was applied to measure herbage mass in some subterranean clover varieties on site. By calibration, some sound regression equations were generated and a representative regression equation was used to determine the net herbage mass, which resulted in consistently acceptable experimental data.

KEY WORDS

Coefficient of determination, calibration, herbage mass, PastureProbe™ (PP), regression equation, subterranean clover

INTRODUCTION

PastureProbe™ is the trade name of a pasture-measuring instrument, designed and manufactured by Mosaic Systems Limited of New Zealand (1). Although it allows for greater accuracy in predicting pasture growth and evaluation of pasture growth trials, PastureProbe™ should always be applied using discretion and by calibration, because of the complex scenarios of pasture growth and its surroundings. This equally applies to our crop/pasture rotation system research, a GRDC-funded project, in which effective and efficient management of field pasture trials is entailed.

MATERIALS AND METHODS

To provide reliable and accurate measurement of the herbage mass of a pasture species, we need to calibrate PastureProbe™ (PP). At our Hamilton experimental site, a sandy clay loam soil with pH 4.8 (in CaCl₂), the herbage mass of some subterranean clover varieties was directly measured in site by the instrument to give a reading of dry matter (DM) production (kg/ha) instantaneously. Procedures included: (a) placing a quadrat (0.1 m²) in the pasture; (b) taking 10 readings with the PP, which averages them automatically; (c) harvesting the pasture from within quadrat; and (d) oven-drying the herbage at 60°C to constant weight to determine the herbage mass. Samples were collected at several different stages of pasture growth showing different growth vigour and appearances. The mean reading of herbage mass by the PP was then correlated with the actual data of herbage dry weight to establish regression equations, with a high value of coefficients of determination (R²) being judged as statistically sound. This regression equation was then used to monitor the pasture growth under investigation.

RESULTS AND DISCUSSION

Three separate calibrations of the PP are shown in Table 1. Calibrations 1 and 2 were derived from relatively uniform swards of clover, however the small range of herbage mass in the second calibration resulted in a poor R² (=0.15). When the data were pooled, a satisfactory equation predicting the herbage mass over a wider range was obtained. Calibration 3 was derived from a mixture of clover and stubble (R² = 0.64), and differed apparently from the pooled equation.

Using regression equation from the pooled data, $y = 1.2133x - 898.61$ (R² = 0.93), we monitored and determined the pasture growth of three different subterranean clover varieties and one mixture over four sampling dates; this is shown in Figure 1. A consistent wide range of herbage DM was observed among these four entries for each of their growth stage, and this is in great agreement with our previous finding for 1998. An advantage of the PP is that "air readings" are automatically taken into account for each set of pasture reading, this is different from that of earlier probes (2). In summary, different types of pasture

require separate calibrations; in addition to this, the range of herbage mass in calibration cuts must cover the range of expected readings in the pasture, or the R^2 will be poor (see Table 1).

Table 1. Some calibration regression equations of herbage DM production determination in subterranean clover at Hamilton, 2000.

Calibration	Size	Range by PP "x" (kg/ha)	Actual range "y" (kg/ha)	Regression equation with coefficient of determination (R^2)	Residual standard deviation	Remarks
1	5	1282~3202	720~2970	$y = 1.2053 x - 800.72$ $R^2 = 0.98$	146	wide range
2	8	1213~1569	750~ 960	$y = 0.1328 x + 634.01$ $R^2 = 0.15$	70	small range
3	16	1052~2305	450~2060	$y = 0.9729 x - 99.41$ $R^2 = 0.64$	208	Mixture of pasture and old stubble
1 and 2 pooled	13	1213~3202	720~2970	$y = 1.2133 x - 898.61$ $R^2 = 0.93$	311	Pure pasture

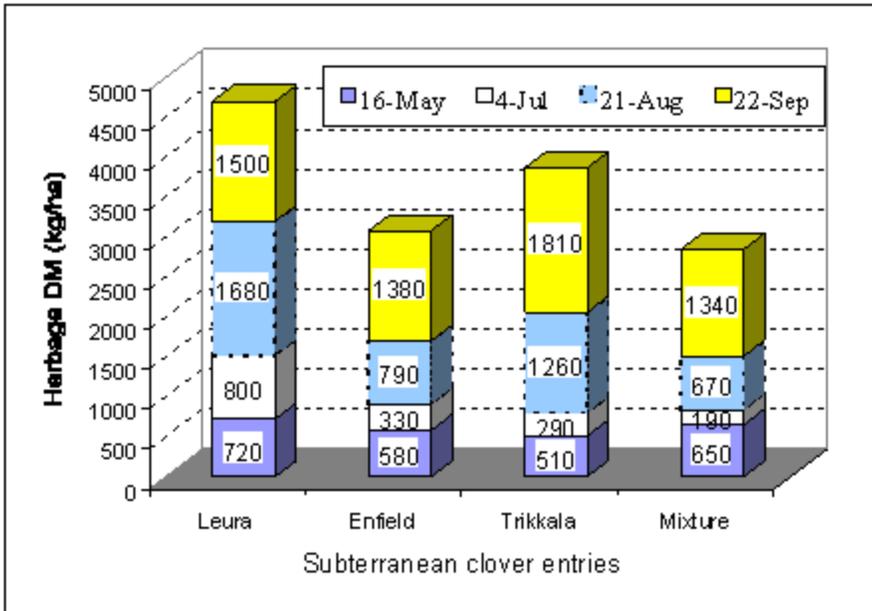


Figure 1. Net herbage DM (kg/ha) of four subterranean clover entries over four sampling dates at Hamilton, 2000.

REFERENCES

1. Anon. 1998. *PastureProbe™, User Manual*, PlantPlan Ltd 1998.
2. Vickery, P.J., Bennett, I.L. and Nicol, G.R. 1980. *Gr. For. Sci.* 35, 247-252.