Describing the sward structure of wheat and annual ryegrass swards grazed by lambs in southern NSW

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Introduction

Dual-purpose wheats are now an established part of the feed base on many mixed-farms in southern NSW. However agronomic practices can vary and it is unknown whether row spacing will impact the availability of forage for grazing by sheep. Intake has been shown to be affected by a range of factors including tiller length, pasture height, sward density and pasture mass (Allden and Whittaker 1970; Black and Kenney 1984). This study sought to describe the differences in sward structure of grazed wheat swards at two different row spacings in terms of mean height, row height and bulk density and compare this to an annual ryegrass pasture presented as a continuous pasture.

Methods

Paddock preparation

Dual-purpose wheat (*Triticum aestivum*, cultivar Wedgetail) and tetraploid annual ryegrass (*Lolium rigidum*, variety Winter Star II) were established at the Charles Sturt University farm at Wagga Wagga (35.05°S, 147.35°E; elevation 219m) in 2012. Plots (0.93ha) were sown in a completely randomised design with three treatments (wheat at two row spacings or annual ryegrass) with 3 replicates. Wheat was sown on April 23 at row spacing 17.5cm (W17) using a sowing rate 75 kg/ha and a fertiliser rate 80 kg/ha; or at row spacing 35cm (W35) using a sowing rate 73 kg/ha and a fertiliser rate 80 kg/ha. Monammonium phosphate (MAP) fertiliser for both wheat row spacings was drilled at 17.5cm spacings. Plots to be sown with annual ryegrass were pre-drilled with MAP fertiliser on April 21 at a rate of 88 kg/ha and 17.5cm row spacings. On April 22 ryegrass seed was surface spread at a rate of 40 kg/ha and plots were harrowed to cover the seed. Ryegrass plots were surface spread with urea on June 16 at a rate of 100 kg/ha.

Characterisation of wheat and ryegrass swards

Sward surface height was measured weekly from the beginning of the third week of grazing using a method based on the drop-disc technique (Stewart *et al.* 2001). A device was created consisting of a central piece of electrical conduit (height 100cm; diameter 2 cm) down which a polystyrene “disc” (weight 1.05g; height 3 cm; outer diameter 5.3 cm; internal diameter 2.8 cm; a 0.7 cm gap in the disc allowed it to be stored on a screw at the drop height between measurements) was dropped freely from a height of 50 cm. Graduations were marked on the conduit every 1cm, and readings were made to the nearest centimetre at the highest point of the disc each time it was dropped. A frame was created to measure changes in height across wheat rows, using nine “drop-disc” devices (as described above) held in a rigid frame. The pieces of conduit were equally spaced over a distance of 35 cm in two rows (*i.e.* a row of 5 and a row of 4), offset by 5cm so that each disc did not inhibit the vertical fall of adjacent discs. The frame was placed across a quadrat (70 cm x 35 cm) so that variation in height was recorded across two rows (35 cm spacing) or four rows (17.5 cm spacing); measured by taking 17 height readings from north to south across rows. The quadrat was then cut at ground level using electric shears, washed, dried at 80°C and weighed to determine the pasture mass and converted to feed on offer (FOO; kg DM/ha). Mean row height (mean of two mid-row measurements for W35 and four mid-row measurements for W17) and mean height across the quadrat (mean of 17 measurements for W17, W35 or ryegrass) were calculated for each quadrat. The 17 height readings for the quadrat were used to estimate the area under the canopy for each quadrat measured with the device. This was then converted to the mass per unit volume (g/m^3) under the pasture canopy for each quadrat.

All swards had been grazed by cross bred lambs from at least July 18 at varying stocking rates. Characterisation of grazed swards across a range of pasture mass’ per quadrat (n=36 per row spacing) was completed on August 15, 22 and 29.

Statistical Analysis

Multiple linear regression with row spacing as groups was applied using Genstat 15th Edition. Relationships for height and bulk density with feed on offer were confounded at high and low dry matter values; therefore

Table 1. Relationship between row height, mean height and bulk density with FOO (kg DM/ha)

	W17	W35	Ryegrass	
Row height (cm)	3.692+0. 00720*FOO	3.692+0.00720*FOO	N/A	R^2 = 63.6%; P<0.001
Mean height (cm)	0.0059*FOO	0.0042*FOO	0.0024*FOO	R^2 = 89.1%; P<0.001
Bulk density (g/m^3)	1290[1]	1823[1]	1823+0.669*FOO	R^2 = 69.3%; P<0.001

[1] The slope for bulk density of pasture was not significant for wheat treatments, therefore bulk density did not change with increasing FOO for wheat treatments

the quadrat dataset was restricted to the range 300-1750 kg DM/ha, which incorporated the range of mean feed on offer values for sheep grazing wheat at a plot level.

Results

The relationship between wheat row height and FOO was not different between wheat row spacings. Slope of mean height against FOO for W35 was significantly higher than ryegrass (*P*=0.001) and lower than for W17 (*P*<0.001), and the intercept was not significant. Slope for pasture bulk density was not significant for wheat row spacings (*P*=0.131) however the intercept was significantly lower (*P*=0.046) for W17 compared with W35. The slope for bulk density of ryegrass was significantly different from wheat (*P*=0.033). The equations for these relationships are displayed in Table 1.

Conclusion

The relationship of mean height and bulk density with pasture mass of grazed swards of dual-purpose wheat were altered by row spacing, and was different between wheat (sown as a row crop) and ryegrass (sown as a continuous pasture). The relationship of wheat row height and pasture mass was not altered by changes in the width of row spacing in grazed swards.

References

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