Brassica as summer feed for lambs in southern New South Wales

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Brassica forages have the potential to extend summer feed for lamb production in southern NSW, when many pastures are senescent and of poor nutritional quality. Animal performance on brassica forage is often below that predicted based on its high digestibility and metabolisable energy value, with some reports of delayed liveweight gain (LWG) in livestock when introduced to brassicas (Barry *et al.* 1984). Potential issues include the presence of high concentrations of plant secondary compounds (e.g. glucosinolates and S-methyl cysteine sulphoxide), low availability of essential micro-nutrients (Cu, Se and I) and low levels of fibre (Barry 2013). Variation in these characteristics may be affected by plant genotype.

We conducted a summer grazing study in Canberra using Merino ewe lambs naïve to brassicas to test whether variation in lamb performance could be attributed to nutritional differences between brassica genotypes. We selected four forage brassicas representing the major foliage-types (in contrast to bulb-types) currently on the Australian market: dual-purpose canola (*Brassica napus* cv. Hyola 970CL), forage rape (*B. napus* cv. Titan), kale (*B. oleracea* cv. Sovereign) and raphanobrassica (*B. oleracea* x *Raphanus sativus* cv. Pallaton). Three 0.1-ha plots were sown to each genotype in spring 2018. Grazing commenced 12 weeks later (Day 0), with 4 lambs/plot on two kale plots with DM <1t/ha and 6 lambs/plot on all other plots). On Day 0, half of the lambs on each plot received a Cu, Se and I drench (prepared according to manufacturer instructions: Iodine Combo Drench for Sheep and Goats, Vetpak NZ) to determine whether LWG could be improved by correcting a potential micro-nutrient deficiency. Fasted LW and DM were quantified weekly. Plots were de-stocked when brassica stem height reached ~10cm (≤59 days). We used linear mixed effects models in R to test fixed effects with plot as a random effect.

The brassica genotypes differed significantly in DM production (raphanobrassica = canola > rape > kale) but not in nutritional values (Table 1). Rates of LWG differed between weeks and brassica genotypes but was not affected by available DM or nutritional quality. Across all genotypes, lambs lost weight during the first three days after introduction, during which biomass on all plots increased (i.e. intake was very low). Subsequent rates of LWG were higher on rape and canola than on kale and raphanobrassica. Lambs that received the micro-nutrient drench did not perform better overall than un-drenched lambs regardless of cultivar (data not shown).

	Canola	**Rape**	**Kale**	**Raphanobrassica**
DM on Day 0 (t/ha)	3.6 ± 0.2^{A}	1.8 ± 0.3^{B}	1.0 ± 0.3^{C}	4.0 ± 0.4^{A}
DM digestibility (%)	71.4 ± 0.9	70.6 ± 0.3	70.9 ± 1.2	72.6 ± 0.7
Metabolisable energy (% DM)	10.6 ± 0.1	10.5 ± 0.0	10.4 ± 0.2	10.8 ± 0.1
Crude protein (% DM)	21.8 ± 1.4	24.7 ± 1.6	18.8 ± 1.2	21.7 ± 1.3
Neutral detergent fibre (% DM)	32.0 ± 1.3	31.4 ± 0.2	32.0 ± 1.2	29.0 ± 0.6
DM intake (kg/head/day)	1.3 ± 0.3^{AB}	1.1 ± 0.2^{B}	1.7 ± 0.2^{A}	1.2 ± 0.1^{AB}
LWG Day 0-3 (g/head/day)	-511 ± 74	-462 ± 44	-648 ± 62	-563 ± 62
LWG Day 4 onward (g/head/day)	132 ± 12^{A}	139 ± 16^{A}	97 ± 12^{B}	103 ± 8^{B}
Grazing days (/ha)	1880 ± 208^{B}	1220 ± 140^{C}	1847 ± 256^{B}	3280 ± 262^{A}

 # Values represent mean ± SE. Superscripts denote significant differences between cultivars (P < 0.05). DM intake calculations account for plant growth.

Table 1. Dry matter (DM) production and nutritional quality of four genotypes of spring-sown forage brassica in summer 2019, and associated intake and liveweight gain (LWG) in Merino ewe lambs.[#]

Supplementary feeding appears to be necessary to avoid weight loss of lambs when they are first introduced to forage brassicas. The DM production, plant nutritional value, and micro-nutrient supplement did not affect LWG. Lambs showed greater rates of LWG on genotypes of *B. napus* (canola and rape) than *B. oleracea* (kale and raphanobrassica), but this was not reflected in rates of DM intake. Further work is needed to determine whether genotypic differences in the composition and/or concentrations of plant secondary compounds drive differences in animal performance on forage brassicas, with implications for plant breeders selecting favourable traits in cultivar development and for farmers selecting cultivars to improve lamb LWG.

References

Barry TN (2013) *Animal Feed Science and Technology* **181**, 15-25.
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