|  |
| --- |
| **Title:** *(Use Normal style (Times New Roman 12). Only capitalise the first letter of the first word. No full stop at the end of the title)* |
| Effect of offering rapeseed-based diets differing in crude protein content on dairy cow performance |
| **Summary:** *(Your summary (Times New Roman 10) must use Body text style and must not be longer than this box)* |
| **Application** Soya can be sucessfully replaced with rapeseed meal (RSM) in dairy cow diets. **Introduction** Reducing CP levels in dairy cow diets can improve nitrogen (N) use efficiency (defined as N output in milk/N input; NUE), and reduce N loss to the environment. A total diet CP level of between 15- 16% has been suggested as optimal to maintain milk production while improving NUE (Barros et al., 2017; Lavery et al., 2022). Alongside environmental pressures to reduce diet CP levels, there is increasing retailer and societal pressure to remove soybean meal (SBM) from dairy cow diets. Therefore, the current study examined the impact on cow performance and NUE of replacing SBM with rapeseed meal (RSM) in diets differing in CP levels.**Materials and Methods** A continuous designstudy using 88 Holstein dairy cows (28 primiparous) examined three RSM based diets containing either 14% (R140), 15.5% (R155) or 17% (R170) CP ((dry matter (DM) basis). A fourth ‘conventional diet’ containing soya had a total diet CP (DM basis) of 15.5% (C155). Diets R140, R155, R170 and C155 supplied 93, 98 103 And 106% of metabolisable protein (MP-N) requirements, respectively. Cows were enrolled post-calving and remained on treatment until day 252 of lactation. A common silage (mean DM, 307 g/kg; CP, 119 g/kg DM; metabolisable energy, 11.2 MJ/kg DM) was offered across all treatments throughout the study. Concentrates offered were isoenergetic, while differing in their ingredient composition. Silage and concentrates were offered in the form of a total mixed ration (50:50 DM basis). Blood samples were taken at weeks 4, 8, 12, 16, 20, 28 and 36 post-calving. The weekly means of individual cow dry matter intakes (DMI) and performance data were analysed using REML, with cow as the experimental unit and week as the repeated measure (GenStat 21st ed., VSNI Ltd).**Results** Within the RSM diets, DMI, milk protein content, fat plus protein yield, milk urea and plasma urea content increased with increased CP content (P < 0.001; Table 1). Compared to the other two RSM diets, milk yield (P < 0.001) was increased with R170, while milk fat (P = 0.002) was increased with R140. Compared to the RSM diets, DMI was higher with C155 (P < 0.001), while milk yield and fat plus protein yield (P < 0.001) with C155 did not differ from R170. Milk fat content with C155 was not different from R140, while milk protein with C155 was not different from R140 and R155. Milk urea and plasma urea content of C155 was intermediate between R155 and R170 (P < 0.001). Plasma β-hydroxybutyrate concentrations were greater in C155 compared to the RSM treatments. Bodyweight and condition score were unaffected by treatment. Compared to C155, NUE was greater with the RSM treatments, with R140 having the greatest NUE (0.36). **Table 1** Performance of cows offered either rapeseed-based diets differing in crude protein content or a conventional diet.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | P-Value |
|  | R140  | R155 | R170 | C155 | SED | Trt (T) | Week (W) | (T × W) |
| Total DMI (kg/d) | 21.2a | 22.0b | 22.9c | 23.5d | 0.28 | <0.001 | <0.001 | 0.318 |
| Milk yield (kg/d) | 31.5a | 32.7a | 34.8b | 34.4b | 0.81 | <0.001 | <0.001 | 0.573 |
| Fat (g/kg) | 49.8b | 48.4a | 48.6a | 49.8b | 0.46 | 0.002 | <0.001 | 0.999 |
| Protein (g/kg) | 34.7a | 35.8b | 36.6c | 35.1ab | 0.36 | <0.001 | <0.001 | 0.131 |
| Fat + protein yield (kg/d) | 2.64a | 2.75b | 2.94c | 2.91c | 0.054 | <0.001 | <0.001 | 0.987 |
| Milk urea (mg/kg) | 74a | 86b | 114d | 97c | 1.9 | <0.001 | 0.218 | <0.001 |
| Plasma βHB (mmol/L) | 0.52a | 0.49a | 0.49a | 0.58b | 0.025 | <0.001 | <0.001 | 0.279 |
| Plasma NEFA (mmol/L) | 0.21 | 0.22 | 0.24 | 0.21 | 0.016 | 0.160 | <0.001 | 0.316 |
| Plasma urea (mmol/L) | 2.22a | 2.68b | 3.78d | 3.00c | 0.091 | <0.001 | <0.001 | 0.206 |
| Milk N/N intake (NUE) | 0.36c | 0.34b | 0.34b | 0.33a | 0.004 | <0.001 | <0.001 | 0.684 |

*DMI; dry matter intake, NEFA; non-esterified fatty acids, βHB; β-hydroxybutyrate, NUE; nitrogen use efficiency***Conclusions** There was a positive production response to increasing levels of total diet CP with the RSM diets, reflecting an undersupply of MP-N with R140 and R155. Soya-bean meal can be removed from diets with no loss in performance.**Acknowledgments** This project was funded by Department of Agriculture, Environment and Rural Affairs (DAERA), Trouw Nutrition, and John Thompsons and Sons Ltd.**References**Lavery, A., Craig, A., Gordon, A. & Ferris, C.P. (2022). Proceedings of the BSAS Annual Conference, Nottingham. Abstract 38.Barros, T., Quaassdorff, M., Aguerre, M., Colmenero, J., Bertics, S., Crump, P., & Wattiaux, M. (2017). Journal of Dairy Science, 100(7), 5434-5448. |