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Timing of testing critical when determining the phosphorus (P) status of beef cattle in northern Australia

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Phosphorous (P) deficiency in northern Australia can significantly impact the productivity and profitability of beef cattle businesses due to reduced cattle growth rates, reproductive performance, and increased mortality (Bowen *et al.* 2019). Plasma inorganic P (PiP) in conjunction with estimates of diet quality from faecal analyses is the best method of diagnosing P status in cattle (Dixon *et al.* 2020). Testing should be undertaken at the end of the rainy season when protein and energy are above maintenance in the animal's diet. Appropriate timing can be challenging on extensive properties as it is most practical to undertake sampling when cattle are mustered for routine husbandry practices. Timing of testing is also more challenging in regions such as south west Queensland with highly variable and less summer dominant rainfall than the seasonally dry tropics. The Mulga Lands of south west Queensland are considered P deficient, and common industry practice is to have two musters per year (Bowen and Chudleigh 2021). Therefore, the objective of this work was to determine if P status testing at a routine muster in June, was appropriate to determine the P status of cattle on a Mulga Lands property.

In June 2020 on a property in the Mulga Lands, 23 #8 (2018 weaned) Droughtmaster cross heifers were sampled from a mob of 170 mixed age females mustered for pregnancy testing. The heifers were grazing a 1250 ha paddock with a mix of red and black soil types dominated by mulga *(Acacia aneura)* and herbage species. The heifers selected for sampling were pregnancy tested as 5+ months in calf. The animals were body condition scored (BCS) (1 = low, 5 = high), blood sampled for PiP, and dung sampled for diet quality analyses (dry matter digestibility % [DMD]). Four soil samples were collected from the paddock for soil phosphorus analysis using the Colwell P method.

Two soil samples had Colwell P levels in the deficient range (4–5 mg/kg) and two were in the adequate range (6–8 mg/kg). The sampled heifers had a BCS of 3 to 4. The average PiP of the heifers was 1.38 mmol/L with a range of 0.7–1.9 mmol/L. The average DMD of the diet was 48.3% and the non-grass component of the diet was 70.3%.

The soil sample results indicate that the grazed paddock was deficient to marginal for P (Bowen and Chudleigh 2021). Mean PiP is in the marginal range (1.1–1.6 mmol/L) (Dixon *et al.* 2020). However, the diet DMD of 48.3% is below the maintenance level of 50% required to assess P status as both diet protein and energy must be above maintenance (Dixon *et al.* 2020). The low DMD is reflective of the time of season that the sampling was conducted (June) and consistent with the diet non-grass component of the diet being 70.3%. Mulga leaves likely make up most of the non-grass component and are low in digestibility and P (Bowen and Chudleigh 2021). The low soil P, known low P content of mulga leaves and low blood PiP all indicate that P is likely to be limiting cattle performance, however the diet DMD% at this sampling time suggests that energy intake is also limiting. Therefore, an accurate assessment of the P status of the heifers cannot be determined.

The most significant learning from this study is to ensure P screening is undertaken when protein and energy levels of feed are adequate, ideally mid-late rainy season (cf. March and April). Sampling when practically convenient, as was the case with this work, did not allow for accurate assessment of the heifers' P status. More P status testing needs to be undertaken in south west Queensland and other regions with highly variable rainfall so producers, researchers and advisers can develop strategies for more effective testing and to make better use of P status information in cattle nutritional management.

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