

Addressing phosphorus deficiency in northern Australian beef production

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abstract

Phosphorus (P) deficiency is a significant issue, leading to a loss in productivity and profitability for many northern Australian beef businesses. Phosphorus is a major component of muscle, bone, and many essential metabolic pathways. Decreased feed intake is the first sign of a chronic P deficiency and the major cause of physiological and performance outcomes such as depressed live-weight gain, lower milk production, poor fertility, bone weakening and death in extreme cases (Dixon, 2020). Dietary P has been shown to be critical for breeders, increasing live weights by up to 130 kg and reducing mortality by up to 50%. Despite extensive and conclusive research on the effect of P deficiency and how it can be overcome through supplementation, the biggest challenge has been quantifying P deficiency on a mob basis, and then demonstrating an economic benefit to supplementation (Bowen *et al*, 2019). Meat and Livestock Australia (MLA) endeavoured to address the P deficiency dilemma through an awareness and adoption exercise (The P Challenge) using the plasma inorganic phosphorous (PiP) test to determine the P status of mobs or paddocks for participants. The value of PiP testing for grazing cattle has been demonstrated with results suggesting a close alignment with dietary P, especially through periods of high P demand, including growth, lactation or pregnancy (Quigley *et al*, 2015). Importantly, PiP P status interpretation and recommendations incorporated diet quality data, whereas dry matter digestibility (DMD) at testing was required to be above maintenance (>54% DMD). Once a deficiency was identified, recommendations were provided to resolve productivity barriers.

Methodology

During the project blood samples were analysed for PiP from 96 properties across Queensland (61), Northern Territory (16) and Western Australia (23) at the end of the wet season in 2019 and 2020. For each mob sampled a random selection of 20 animals from one animal class were sampled. The classes of animals sampled included growing animals, heifers in early-mid pregnancy, or lactating first calf cows. When combined with diet quality assessments based on faecal NIRS results from samples collected at the same time as the blood test and herd demographic data, the P status of the mob was determined. Participating producers received customised feedback with interpretation and potential actions to discuss with their veterinarian or nutrition consultant.

Results

Properties were characterised against several criteria. In the 2019 P challenge there was a range of land types on the properties paddocks sampled (19.6% forest, 15.2% alluvial flats, 16.6% sandy desert, 12% open forest and 12.3% open grassland) and pasture species (19.7% Buffel, 7.1% bluegrass, 10.9% spinifex and 6.8% Mitchell). Animal classes sampled comprised 77.5% young breeders and 4.9% steers. The genotypes sampled were 28.7% *B. indicus*, 36.4% cross bred and 7.3% *B. taurus*. The age groups were 40.4% 2-3 years, 29.4% 3-5 years and 14.9% 1-2 years. Lactating animals comprised 26% of those sampled and non-lactating 58.6%. Notably, some participants did not provide all information regarding paddock or livestock criteria, thus, why percentages do not total 100%.

Across all properties 59% had a mean PiP >1.5 mmol/L (acceptable) as indicated in Fig 1. A further 20.4% were in the 1.1 – 1.5 mmol/L range (marginal), and 20.6% had a mean PiP <1.1 mmol/L, (deficient).

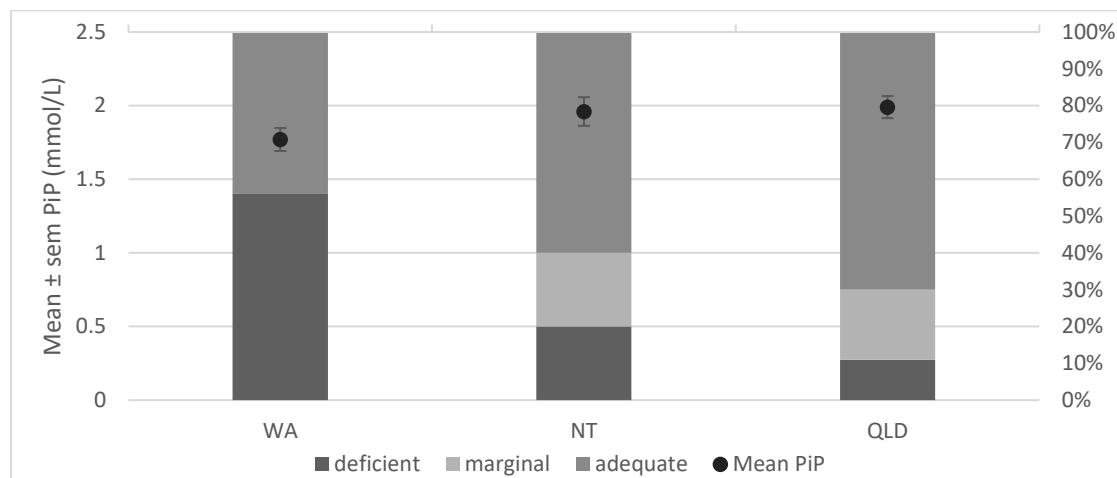


Figure 1. 2019 Project Results: Mean (\pm sem) PiP (mmol/L) and status (% of the total mob samples submitted) compared to minimum requirement, by participating state herds.

Figure 1 displays the 2019 participants by Australian State. Across the states there were 45 participants in Queensland, 10 in the Northern Territory and 13 in Western Australia. As observed, across the states the average PiP was adequate, however, there were still producers with marginal or deficient mobs.

In 2020, the properties involved in the P challenge were also characterised; (18.5% forest, 15% alluvial flats, 14% sandy desert, 13.2% open forest and 12.2% open grassland) and pasture species (17.2% Buffel, 9.2% bluegrass, 8.6% spinifex and 7.2% Mitchell). Animal classes sampled comprised 82.6% young breeders and 6.6% steers. The genotypes sampled were 32.8% *B. indicus*, 27.4% cross bred and 10.96% *B. taurus*. The age groups were 35.6% 2-3 years, 31.5% 3-5 years and 19.1% 1-2 years. Lactating animals comprised 28.7% of those sampled and 57.5% non-lactating. As in 2019, some participants did not provide all information regarding property paddock or livestock criteria, thus, why percentages do not total 100%.

Across all properties 62% had a mean PiP >1.5 mmol/L (acceptable) (Figure 2). A further 15% were in the 1.1 – 1.5 mmol/L (marginal) range, and 23% were less than <1.1 mmol/L, (deficient).

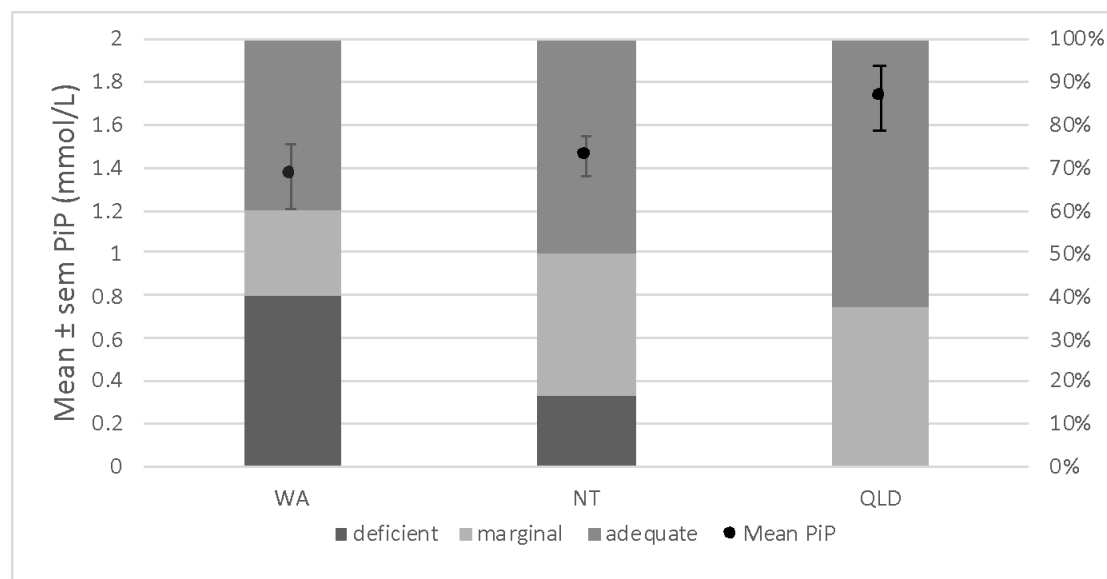


Figure 2. 2020 Project Results: Mean (\pm sem) PiP (mmol/L) and status (% of the total mob samples submitted) compared to minimum requirement, by participating state herds.

Figure 2 displays the 2020 participants by Australian State. Across the states there were 16 participants in Queensland, 6 in the Northern Territory and 10 in Western Australia. The lowered participation was attributed to the Covid outbreak. Similar to 2019 the averaged state results were adequate, although some producers did have marginal or deficient mobs.

P Supplementation has been reported to increase PiP levels, lifting liveweight at first calving, re-conception rates, and calf weaning weights – all leading to economically beneficial outcomes for deficient cattle (Schatz, 2016). The MLA P Challenge highlighted the value of the PiP test to determine deficiencies at the mob scale on individual properties. This is an ongoing initiative to raise awareness of supplementation opportunities, along with building a broader picture of P deficiency status across northern Australia.

A follow up with participant producers, revealed positive feedback in relation to P awareness in livestock production efficiency and profitability (Schatz, 2016). This was particularly notable for participants who received information regarding stock that were marginal or P-deficient in 2019. These producers in the following year (2020) had sought further information on P deficiency and supplementation from the initial interpretation and recommendations from MLA.

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