



Breed impacts the preferential intake of hydroxychloride and sulfate sources of trace minerals in growing beef heifers

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In tropical and subtropical areas, cattle graze all year, and trace mineral supplements are commonly provided to support productivity. These supplements are usually salt-based and offered for free-choice consumption, but the amount individual cows eat can vary widely. This inconsistency is influenced by factors like the season, location, water salt content, the type of trace mineral used, and the cattle breed. Two main types of trace minerals are used: ionic salts, like zinc sulfate, which dissolve quickly in the rumen, and hydroxychloride minerals, which are less water-soluble and often lead to higher consumption rates. Past research has shown that breed affects how cattle consume minerals. For example, Brahman cows tend to visit mineral feeders more in the afternoon than Angus cows (Ranches et al., 2021). Additionally, cattle with *Bos indicus* genetics (like Brahman) differ from *Bos taurus* breeds (like Angus) in their grazing habits, physiology, and mineral processing (Cooke et al., 2020). The following study was conducted in Brazil (Souza et al., 2023), but the results can also be applied in Florida. The study tested whether Nelore heifers (a *Bos indicus* breed) prefer hydroxychloride minerals (**HYD**) over sulfates minerals (**SUL**) more strongly than Angus × Nelore heifers (a *Bos taurus*-influenced breed). The study also wanted to evaluate if this preference changes when minerals are mixed into protein supplements rather than salt-based supplements.

Two experiments were conducted. Over 112 days, Nelore and Angus × Nelore heifers were monitored in individual pens, with two key testing periods: **Experiment 1 from day 0 to 55** = Minerals (SUL vs HYD) were added to a salt-based supplement from day 0 to 55 (target intake between 2 to 4 oz daily) and individual consumption measured daily from day 0 to 28 to 55 (Figure 1); and **Experiment 2 from day 56 to 112** = Minerals (SUL vs. HYD) were added to a protein supplement (target intake of 1.5 lb daily) from day 56 to 112 and individual consumption measured daily from day 84 to 112. During each testing period, the heifers were given free access to both supplement types to see which they preferred. Supplement composition of each experiment is shown in Table 1.

Key Findings

When offered salt-based mineral supplements, Nelore heifers consistently showed a stronger preference for the hydroxychloride supplements compared to the sulfate supplements, whereas Angus × Nelore heifers alternated between preferences depending on the day (Figure 1). Figure 2 showed that both breeds preferred protein supplements added with hydroxychloride

minerals, but this preference was more pronounced in Nelore heifers. Furthermore, Nelore heifers had more variation in their intake of supplements containing sulfate compared to hydroxychloride, suggesting hydroxychloride sources encouraged more consistent consumption.

In conclusion, hydroxychloride minerals were more appealing to heifers and led to more uniform supplement consumption than sulfate minerals, particularly for 100% *Bos indicus* heifers. The findings highlight the potential of hydroxychloride sources to reduce intake variability, improving the effectiveness of supplementation programs, especially in *Bos indicus* breeds that may be more sensitive to sulfate minerals.

References

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Upcoming Events

Ona Highlight – ‘Controlling Australian Beardgrass in Florida Pastures’ – March 11, 11:00 – 11:45 a.m. with Dr. Brent Sellers and Dr. Tezny Mncube. Visit our website calendar to register for the Zoom or call us to attend in person: 863-735-1001.

Ona Highlight – ‘Heat Stress in Pregnant Beef Cows’ – Apr. 8, 11:00 – 11:45 a.m. with Dr. Philippe Moriel. Visit our website calendar to register for the Zoom or call us to attend in person: 863-735-1001.

UF/IFAS Range Cattle REC Field Day – April 17, 8:00 a.m. – 3:00 p.m. Learn about faculty and student research, visit field sites, and enjoy a steak lunch. Register at <https://rcrec-2025-fd.eventbrite.com>. Questions, call us at 863-735-1001.

UF/IFAS Range Cattle REC - 3401 Experiment Station Rd., Ona - <http://rcrec-ona.ifas.ufl.edu/>

Table 1. Nutritional composition (mean \pm standard deviation) of mineral and protein supplements¹ offered to Angus \times Nelore and Nelore heifers from day 0 to 55 (Experiment 1) and day 56 to 112 (Experiment 2), respectively (adapted from Souza et al., 2023).

Item	Exp. 1 (day 28 to 55)		Exp. 2 (day 84 to 112)	
	SUL	HYD	SUL	HYD
Dry matter (DM), %	85 \pm 0.7	86 \pm 0.7	94 \pm 0.3	94 \pm 0.3
Total digestible nutrients, %	-	-	42 \pm 1.8	42 \pm 2.0
Crude protein, %	-	-	47 \pm 8.3	45 \pm 1.5
Cu, mg/kg	1388 \pm 276	1301 \pm 264	220 \pm 25	196 \pm 33
Mn, mg/kg	1499 \pm 155	1284 \pm 143	162 \pm 14	147 \pm 5
Zn, mg/kg	5199 \pm 1187	5565 \pm 665	795 \pm 24	752 \pm 85

¹ Exp. 1 = white salt-based trace mineral supplements (BellNutri, Trouw Nutrition, Campinas, São Paulo, Brazil) added with sulfate (SUL) or hydroxychloride (HYD) sources of Cu, Mn, and Zn were both formulated for a target intake between 2 to 4 oz daily and to provide a minimum of 14% Ca, 8% P, 13% Na, 1% Mg, 4% S, 80 mg/kg Co, 100 mg/kg I, and 26 mg/kg Se, in addition to the amount of Cu, Mn, and Zn described above. Exp. 2 = protein supplements (Lambisk VS, Trouw Nutrition, Campinas, São Paulo, Brazil) added with SUL and HYD sources of Cu, Mn, and Zn were both formulated for a target intake of 1.5 lb daily and to provide a minimum of 5% Ca, 1.5% P, 3% Na, 1.5% S, 2,000 mg/kg Mg, 15 mg/kg Co, 19 mg/kg I, and 5 mg/kg Se, in addition to the amount of Cu, Mn, and Zn described above.

Figure 1 - Average daily supplement intake (% of total intake; Experiment 1) of Angus \times Nelore and Nelore heifers provided simultaneous free choice access to salt-based trace mineral supplementation containing sulfate (SUL) or hydroxychloride (HYD) sources of Cu, Mn, and Zn from day 28 to 55. ^{a,c} $P \leq 0.05$.

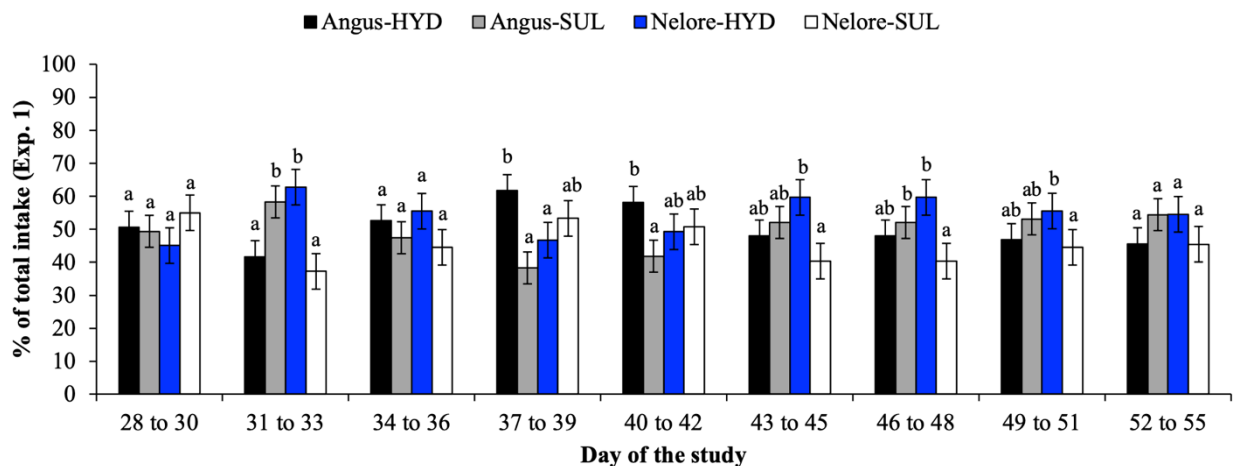


Figure 2 - Average daily supplement intake (% of total intake; Experiment 2) of Angus × Nelore and Nelore heifers provided simultaneous free choice access to protein supplementation containing sulfate (SUL) or hydroxychloride (HYD) sources of Cu, Mn, and Zn mixed from day 84 to 112. ^{ac} $P \leq 0.05$.

