DOS ARBOLITOS
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Client: Sample Report

Sample ID: Sample

Date of Test: 10/10/24

TCEC* (meq)	Adjusted TCEC (meq)	pH	SOM %	Ca:Mg Ratio*
20.4	16.8	8	5.04%	21:1

Comments: *Calcium levels are overestimated due to the type of soil (Alkaline Calcareous) and the extraction method (Ammonium Acetate 8.2) utilized by the lab. TCEC was adjusted by recalculating Base Saturation for Calcium at 68%.

Element	Current lvl. lb/ac	Target lvl. lb/ac	Deficit or Excess lb/ac	Application limit per acre/year:		Amendment/ Fertilizer	Amt. /acre
Sulfur **S**	24	45-70	21-46	100 lbs		Increase Soil Organic Matter (SOM)	5%
Phosphorus **P**	P_2O_2: 123 P= 54	P= 200-400	146-346	175 lbs		Phos Fish, Compost	Var.
Calcium* **Ca**	7221*	6048	1172	N/A		N/A	N/A
Magnesium **Mg**	368	213-256	155-112	N/A		N/A	N/A
Potassium **K**	774	410	364	N/A		N/A	N/A
Sodium **Na**	56	<200	N/A	optional		Water Test recommended before amending Sodium	N/A
Boron **B**	1.9	4	2.1	4 lbs		Borax (11% B) or SoluBor (20.5% B)	20 lb or 10 lb
Iron **Fe**	38	150	N/A	N/A		Adding Iron not recommended for Calcareous Soil	N/A
Manganese **Mn**	70	55-100	N/A	N/A		N/A	N/A
Copper **Cu**	1.72	6-10	4.3-8.7	4 lbs		Biomin® Copper	1 gal.
Zinc **Zn**	3.7	20-40	16.3-36.3	10 lbs		Biomin® Zinc	1 gal.

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Report:

Soil Type: Houston Black (HuB)
From USDA Soil Survey database:
https://soilseries.sc.egov.usda.gov/OSD_Docs/H/HOUSTON_BLACK.html

"The Houston Black series consists of very deep, moderately well drained, very slowly permeable soils that formed in clayey residuum derived from calcareous mudstone of Cretaceous Age. These nearly level to moderately sloping soils occur on interfluves and side slopes on upland ridges and plains on dissected plains."

Interpretation:

"Houston Black," a Calcareous Alkaline soil type, is composed of 10-30% Calcium Carbonate. In soil solution, Calcium Carbonate dissolves into positively charged Calcium ions (**Ca**++) resulting in an increased Total Cation Exchange Capacity. TCEC is a mathematical definition based on measurements of the pH and the amount of **Ca**, **Mg**, **K**, **Na** in a given volume of soil. Knowing the total amount of positively charged exchange sites within a soil substrate tells us how well our soil is able to hold on to nutrients and minerals.

In analyzing the data from Logan Labs, some adjustments and recalculations needed to be made. The Ammonium Acetate Extraction method was chosen due to the high pH of the sample. Most labs use some form of an acid or a base to extract plant nutrients from the soil sample. Strong acids can react heavily with alkaline soil types, so a neutral buffer (Ammonium Acetate) is used to mitigate over extraction of minerals. However, in Calcareous soils, Calcium levels still tend to be overestimated. So when analyzing data from these tests, I adjust the Calcium levels in the TCEC calculations to get a more realistic measurement of the TCEC. I also use a different standard for Base Saturation Percentage than Logan Labs to more accurately reflect the nature of Calcareous soils. Logan Labs sets their standard for base saturation of Calcium at 68% and Magnesium at 12%. This standard is perfectly reasonable for soil types without excess cations or excess Calcium. The standard I use for Calcareous soil sets the base saturation of Calcium at 80-85%, Magnesium at 5-10%, Potassium at 3-8%, and Sodium at 0-1%. You may have noticed on your Logan Labs report that they marked Magnesium (**Mg**) as being deficient. However, when I recalculated the TCEC, and used the appropriate standard for Calcareous soil types, I found **Mg** to be within range.

Findings:

As stated above, **Mg** was found to be within normal range for your soil type. That is true of all of the four major base cations (**Ca**, **Mg**, **K**, **Na**). The balance of these cations is very important and although they are in balance with each other (yay!), **Ca**, **Mg**, and **K** are excessively present in the soil and this presents other challenges.

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Excess Cations means the soil pH will be elevated. When soil pH is between 8.0 and 8.6, Phosphorus (P) tends to be inaccessible to plants and will show a deficit on the soil test. Even if there is more Phosphorus present than is shown on a test, the excess cations (especially **Ca**++ and **Mg**++) will keep it chemically bound to the exchange sites. Amending soils for Phosphorus with fertilizer can be expensive. And due to elevated pH and excess lime (Calcium), may not have much of an effect if mixed below the Organic Horizon (O Layer) because most of that Phosphorus will bind to the excess **Ca**++. One option is to fertigate with Phos Fish as needed during critical growing periods throughout the year. A more strategic application of Phosphorus is to mix high **P** materials into a compost pile and allow the Phosphorus to be consumed by organisms and naturally chelated into the humic and fulvic acids. Another (experimental) option is to fertigate a compost pile with Phos Fish and once the compost is mature, mix it into the garden beds.

Raising Soil Organic Matter (SOM) to 10% is going to address some of the low **P.** Doing so will help lower pH slightly and the improved biology from added OM will help make these nutrients more accessible to plants. Improving SOM will also help with the low (but adequate) levels of Sulfur found in the sample.

In the minor nutrient category, Boron, (**B**), Copper (**Cu**) and Zinc (**Zn**) were found to be deficient in the sample. My recommendation is the address the Zinc deficiency first. Various companies make an OMRI certified amino acid chelated Biomin® Zinc amendment that can be fertigated and foliar sprayed.

The Boron level was low, but adequate. Depending on what you grow, that Boron will eventually be depleted. Amending for Boron is easy and inexpensive. Both Borax and SoluBor are water soluble and can be applied with fertigation or foliar spray.

When it comes time to address the **Cu** issue, take your time. It’s easy to apply Copper, and once it’s there, it stays there. For Copper amendment I also recommend the Biomin® Chelated Copper fertilizers.