SUCROSE YIELD

by

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Dr. Reams owned a large Florida ag consulting firm for over 38 years. This appears to be a report he freely distributed.

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In this article, I am referring to the sucrose as the amount of marketable sugars; tonnage as the total gross tonnage from 43,560 sq. ft. or one acre; and available means that the elements are water-soluble or in protein form and can be used by the sugarcane. Soil balance means that the elements are joining to form protein molecules that will give the greatest yield of sucrose. An increase in tonnage does not always mean an increase in yield. Too often an increase in yield does not result in an increase of sucrose, especially after growing sugarcane on the same area for a few years. In many areas, the sucrose yield begins to decrease after the third harvest. The logical reason for this is that the soil is depleted in the elements that the sugarcane needs for growth and for sucrose.

Since nature knows no laws except that of supply and demand, there must be something lacking in the soil that is used by the sugarcane to make sucrose, that causes a decrease in yield. As pure sucrose is composed of carbon, hydrogen, and oxygen, would it not be reasonable to examine all phases of the possibility that the decrease in yield could possibly be a deficiency of one of these three elements or of an elementary catalyst that joins them together to make sucrose? It could not be hydrogen or oxygen because these two elements come from water (H_2O), so then the deficient element is carbon or its catalyst. The theorem that all carbon used in the manufacture of sucrose comes from the air and there is nothing we can do about it is only a half truth. Soils that are depleted of carbon will result in air that contains less carbon; however, it is not necessary for all the carbon to come from the air. Much of the carbon can be taken in through the roots, as this supply is mined out of the soil by the sugarcane; and its yield will decrease in direct ratio to the supply of the available carbon in the air and the soil.

The question now seems to be, "How does carbon get back into the soil?" There are now no cure-all products. There are methods whereby the problem can greatly be benefited. These methods may be better understood by first noting some things that will decrease yield:

1. too much water;
2. not enough water;
3. a quick change in the water table;
4. not enough available calcium;
5. not enough available phosphate;
6. not enough potash;
7. not enough carbon;
8. not enough nitrogen;
9. too much magnesia of the wrong kind;
10. not enough manganese;
11. not enough zinc;
12. not enough sulphur;
13. not enough copper and other elements;
14. soil that is too low in plant food colloids;
15. an oversupply of nitrogen salts, potash salts, magnesium salts, calcium, sulphur, boron, and others;
16. too much chlorine in the soil;
17. the anion (alkali) and cation (acid) being so far out that sufficient plant food proteins cannot be made to supply the demand of a growing and maturing crop when needed most.

Books could be written on the elements and how to convert them into protein form for direct plant food. The principle of protein molecule formation is understood by a few chemical scientists. Suppose such a book had been written describing in detail more than a million ways for making protein. Likely as not, the very one method that your soil required for a high sucrose yield would not be listed. Very briefly, here are a few more chemical reactions that result when the above mentioned elements are out of balance:

18. An oversupply of water-soluble magnesium displaces carbon in the protein molecule and converts nitrogen into a gas, thus decreasing the probable protein molecule count which decreases sucrose yield.

19. Applications of fertilizers in the wrong cation or anion form decrease yield because plant foods can be stored and stabilized only when in protein form. To cause opposite ions to come into contact with each other is one way protein molecules are made. Fertilizer is energy on which plants live and energy is a result of the chemical action of opposite ions.

20. Too much fertilizer applied at one time can result in a quick release of energy without preserving this energy in protein molecules. Most of the energy is lost unless harnessed by the protein molecules, which results in a decreased sucrose yield.

21. A pH reading is not a quantitive reading, and therefore is very unreliable when used as such. If used as a quantitive reading, it can greatly decrease yields of sucrose.

22. The use of solvents that are not common to the soil in soil analyses will lead one to believe that there are sufficient plant food elements in the soil for a great yield when, actually, the elements tested are unavailable to the crop, resulting

in less yield.

23. Leaf analysis is a poor guide because it will not show the cation and anion count of the soil; therefore, the amount of potential plant food energy is unknown and may result in a lower sucrose yield. Leaf analysis does not show the available plant food reserve that is in the soil. It shows only the amount of plant food taken in by the plant from two days to two months previous to the test. Soil corrections by leaf analysis becomes more of a guess than a science.

24. The temperature of the soil can be governed to a very great extent by applied fertilizers and cultivation practices. Ammonical nitrogen is a refrigerant. Through its application or by a controlled nitrogen conversion plan, soil temperatures can greatly increase sucrose yield, as temperature greatly affects protein formation; and the lack of control can decrease sucrose yield. It does matter which form of nitrogen is applied.

25. Lack of enough kinds and amounts of aerobic bacteria present in the soil will cause a lesser yield. Bacteria does many things to increase yield, such as converting the soil elements into protein which preserves the elements in soil for later use and also serves as a natural means of biological control.

There are many more things that could be mentioned, but the above items that can and do prevent high yields should be sufficient at this time.

It would now be appropriate to list a few things that will increase the yield of sucrose:

1. Correct any or all of the things that prevent a high yield.

2. Correlate the carbon nitrogen ratio.

3. Keep the soil anion count higher during the first three months and the soil cation count higher during the last three months before harvest.

CHEMICAL ANION PROTEINS MAKE GROWTH, AND CHEMICAL CATION PROTEINS MAKE SUCROSE.

4. Apply the fertilizers as soon as possible after harvest. Phosphates join with potash on the protein cation side only when the temperature is less than 70° F. for two hours or more. This union produces sugarcane with a larger barrel, being one factor that determines the caliber of the sugarcane and gives a greater yield.

5. Apply fertilizers that will fit the soil chemistry in such a way as to give the most protein plant food energy possible when needed most. Plant food energy stored in the soil protein molecules is not easily lost to the sugarcane regardless of how much rainfall.

6. In making a soil analysis test, use only water for a solvent, as this is the only solvent common to the soil and sugarcane.

7. Use the soil test as a guide in the mixin g of fertilizers to be applied when the sugarcane is young so that the most energy possible will be made available to the sugarcane crop when the crop will need it most. The older the sugarcane becomes, the more energy will be required to keep it growing and manufacturing sucrose. Sugarcane will grow only in direct proportion to the plant food that is available at the time.

8. Make a soil analysis check every few weeks to see that you are getting the desired chemical action on which you calculated when you applied the fertilizers.

9. Keep plenty of water-soluble, ionized carbon so the crop will not have to depend upon its entire supply of carbon from the air. Keep the carbon/nitrogen ratio equalized for greatest yield of sucrose. When the carbon/nitrogen ratio is at its peak, the carbon is an excellent governor for water.

10. Unless the manganese joins with phosphate, growth cannot continue. Phosphate of manganese forms the seed in all forms of life. When the conditions for

reproduction cease, growth stops. The plant takes in manganese for seed only in the form of phosphate of manganese.

11. Regardless of what the total gross weight of calcium is in the soil, check very carefully the amount that is available. Calcium forms the bulk of matter in sugarcane. The minimum water-soluble calcium should be about 2,000 lbs. per acre when the calcium can be maintained without locking other elements and yet permit the release of energy from the plant food elements.

12. Keep the applied plant food, before it forms into protein, in ratio with the amount of water present in the soil. When there is too much water, the plant food protein forms much more slowly and the result is less available plant food in storage. When there is not enough water, raw manure salts may burn the roots.

13. Keep the ratio of phosphate and potash 2:1 from November to April, and it will join in sufficient amounts in the protein molecule to give tremendous yields (2 P:K).

14. During the summer months, see to it that the phosphate, copper, and magnesium join. This union keeps the outer skin of the sugarcane growing and prevents it from becoming hard and woody and retarding growth. This tough, woody bark will make the sugarcane slow in coming up when planted because water cannot get in to start growth. When the sugarcane has a dry, woody bark, it will come up quicker when the joints are cracked or mashed to permit water to get in, and then growth begins. Unless the bark is pliable and elastic, the sugarcane cannot grow as it is hide bound and will sometimes split because it cannot stretch.

15. Use leaf analysis for folia spray only, and only when soil analyses, using water for a solvent, are not available.

16. Use folia sprays when the soil and leaf analysis shows a deficiency in

available elements and for the maximum amount of sucrose yield.

17. When applying folia sprays, be sure to get the underside of the leaf wet. The leaf takes in food only from the underside.

18. Replace nitrogen in the soil immediately after a flood of rain (four inches or more in a 24-hour period), until the soil chemistry is in such a high state of protein balance that rain will not affect the nitrogen supply to the sugarcane.

19. Before applying fertilizer, calculate the potential plant food energy and estimate the amount of plant food energy that you anticipated. Check the soil to be sure you are getting the correct plant food timing and availability. The most plant food energy will be needed just before harvest.

20. Have the ammonical nitrogen at its peak during the cold season when there is danger of freezing. This will not only increase the sucrose (as the nitrogen is a cation), but will give up to 10° lower freezing point because it will warm the soil. The higher the brix, the lower the freezing point and the less damage done by cold. PLANT FOOD ANIONS MAKE GROWTH, AND THE PLANT FOOD CATIONS MAKE FRUIT OR SUCROSE.

21. Use a soil test as a means of cost accounting. The methods and ideas incorporated in this treatise will greatly decrease the cost of production of sucrose by increasing the yield of sugarcane.

22. The pH is a measure of the resistance between anions and cations. Reinforce the soil by applied fertilizers until they no longer affect the pH readings. This is very inexpensive as the materials that affect pH most are the cheapest plant food elements on the market for sale today and are considered soil conditioners.

23. Use a soil test as a guide for sucrose yield and tonnage quota. If you go over or under the quota, use more soil tests to find out how or why.

24. Use weed killer sprays with great caution as they can upset the bacterial balance in the soil and thus cause a loss of plant food protein. Wind and weather can aid you in the production of sucrose. Fire also has its effects, as well as the price sucrose brings when sold. Regardless of how great the volume of sucrose harvest, unless a substantial profit is realized, it results in a bad year for sugarcane growers; however, the opposite is also true, for if there is a light yield and the returns are excellent, showing a good net profit, the result is a good year. Only the growers who use the greatest amount of true scientific knowledge will be the growers who produce the most for the least cost and effort, and only these growers can survive a low market when it comes. Growers should not be satisfied even when the gross tonnage reaches 80 tons per acre with a brix of 20. This is not a maximum yield, but should be the minimum goal. Growers should strive for more and more each year. This is progress. Luther Burbank said, "Ignorance is the greatest enemy progress ever had."

25. Another way to increase production is for corporations or large individual growers to do their own research in soil analysis and genetics under the supervision of the best trained scientist obtainable as well as use all the aid offered by experiment stations. It may not be possible to employ the services of a highly trained man on a full-time basis because these men are few and far between. When you find a man who can help you, give him a chance to prove himself on his terms in the time that he is able to devote to your project. Soil cannot be built up quickly. It takes three to five years; however, an increase in production of sucrose should be evident not later than the second year, but in most instances, it is evident the first year. Man can make quick changes, but nature takes her time. It takes time to increase the protein in the soil, the proof being an increase in sucrose yield, the same as it takes time to prove the benefits of genetical breeding of varieties. Both are biological phenomena that must be dealt with as such.

Dr. Carey A. Reams has been a consulting scientist for over thirty years. He has studied soils all over the free world and has developed over fifty processes that are used in many phases of agriculture today. He has developed the system of plant feeding by ionization of the plant food elements used in growing crops, and has made charts and tables in the ionization of micro-wave lengths of matter, determining the micro-wave lengths of the frequency of the kinds and also the micronage of organic structure for the kinds, which distinguishes the separate species of the kinds. He is an authority in his field.