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# Corn Ear Leaves in Comparative Sap Analysis

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## Introduction

The driving principle behind comparative sap analysis is the sink vs. source relationship between various plant parts. **Sources** are plant parts that supply resources (sugars, nutrients) to the plant parts that utilize them—**sinks** (Marschner, 1995). Roots and older leaves act as sources of essential nutrients, while the growth points of new leaves function as sinks.

As we reach the reproductive stages, the dominant nutrient sink shifts from the new leaves at the top of the plant to the developing ears. The nutritional relationship between ear leaves and old leaves is then the best indicator of nutrient uptake and partitioning. It's important to note that this shift is not absolute; the dominant growth sink is determined by the relative abundance of vegetative vs. reproductive hormones, with some overlap.

Starting at V10, the plants are in a transition phase as reproductive hormones become increasingly dominant. At these stages, the primary nutrient sink may vary from element to element. To account for this transition, we sample the ear leaves as well as the new and old to get the most complete picture of nutrient uptake.

Each New/Ear/Old set has two significant interpretations for each mobile nutrient: (1) vegetative or reproductive dominance and (2) deficient or excessive uptake. The comparison between new leaf and ear leaf values determines vegetative or reproductive dominance. If the concentration of a mobile nutrient is higher in the new leaves than in the ear leaves, the vegetative growth sink is dominant. Conversely, if the concentration is higher in the ear leaves,

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the reproductive growth sink is dominant for that nutrient. Excessive or deficient uptake can then be determined by the difference in concentration between the old leaves and the leaves of the dominant growth sink. Note that nutrients with a minimal concentration in the grain head typically show vegetative dominance throughout the season. Below, we examine different uptake patterns and how to interpret them.

**Deficient Mobile Nutrient Patterns**

Figures 1 and 2 indicate potentially deficient uptake. Vegetative or reproductive dominance is determined by comparison between new and ear values.

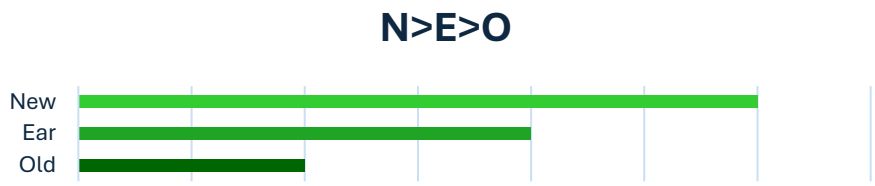


Figure 1

**Relationship:** Deficient

**Dominant Growth Sink:** Vegetative

The new leaf acting as the primary sink indicates the vegetative growth dominance. Uptake is deficient depending on the percentage difference between new and old leaves. (see Figure 1)

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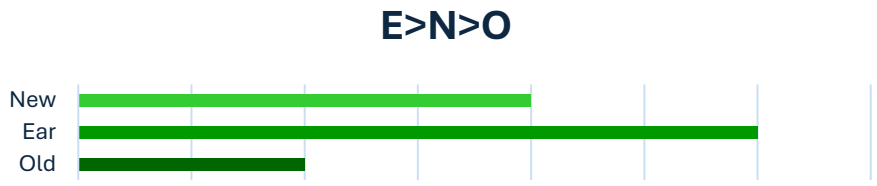


Figure 2

**Relationship:** Deficient

**Dominant Growth Sink:** Reproductive

The ear leaf acting as the primary sink indicates the reproductive growth dominance. Uptake is deficient depending on the percentage difference between ear and old leaves. (see Figure 2)

**Excessive Mobile Nutrient Patterns**

Both patterns indicate potentially excessive uptake.


Figure 3

**Relationship:** Excessive

**Dominant Growth Sink:** Vegetative

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The new leaf acting as the primary sink indicates the vegetative growth dominance. The degree of excess is determined by the percentage difference between new and old leaves. (see Figure 3)

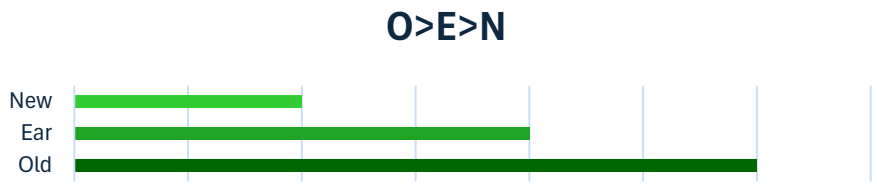


Figure 4

**Relationship:** Excessive

**Dominant Growth Sink:** Reproductive

The ear leaf acting as the primary sink indicates the dominance of reproductive growth. The degree of excess is determined by the percentage difference between ear and old leaves. (see Figure 4)

**Sink-Dependent Mobile Nutrient Patterns**

These two patterns exemplify why ear and new leaf are necessary to identify excesses and deficiencies in uptake during these more complex growth stages. Both patterns represent deficient uptake, but neglecting to sample both new and ear leaves could provide a misleading interpretation.

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**N>O>E**


Figure 5

**Relationship:** Deficient

**Dominant Growth Sink:** Vegetative

The new leaf acting as the primary sink indicates the dominance of vegetative growth. The degree of deficiency is determined by the percentage difference between new and old leaves. (see Figure 5)

**E>O>N**


Figure 6

**Relationship:** Deficient

**Dominant Growth Sink:** Reproductive

The ear leaf acting as the primary sink indicates dominance of reproductive growth. Uptake may be deficient depending on the percentage difference between ear and old leaves. (see Figure 6)

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**Conclusion**

Sap analysis detects developing deficiencies and excesses by monitoring nutrient uptake and partitioning between source and sinks. As the dominant nutrient sink shifts from vegetative to reproductive growth, our sampling protocol must shift. Sampling both ear leaves and new leaves removes the potential for making a critical misinterpretation during this transition.

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## References

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