NUTRIENT INTERACTIONS

- **What** is Interaction ?
- **What is the need** for knowing nutrient interactions??
- **Types** of nutrient interactions ??
- **Interactions** among the essential nutrients ??
- **Case studies** on Nutrient interactions ..
- **CONCLUSION**

WHAT IS INTERACTION ???

- ✓ **Interaction :** In simpler terms Interaction means Influence / **effect of one upon the other** is called INTERACTION .

(OR)

- ❖ The availability of an ion is influenced by the presence of other ions in soil solution is called Interaction .
- ➢ It may positive or Negative or no interaction.

Why we need to know the plant nutrient interactions ??

- There is need for us to know the nutrient interactions and also the interaction of nutrients (fertilizers) with other insecticides/fertilizers/pesticides.
- we must know the antagonistic interactions so that we avoid the Combined application of fertilizers (Nutrients) which having antagonistic effect In between them

  Ex: application of DAP/SSP and Zinc is avoided ..because of antagonistic effect.

NEED for knowing the Interactions???

- **Balanced supply** of of essential nutrients is one of the most important factors in increasing crop yields.
- The **objective** of this topic to discuss interactions among major and minor nutrients in crop plants.
- In crop plants, the nutrient interactions are generally measured in terms of growth response and change in concentration of nutrients.

- ✓ To know what combinations of fertilizers are suitable for application at one time
- ✓ To know the effect of one nutrient upon the other..
- ✓ To minimize the antagonistic effects by applying
  -Right quantity of fertilizers at Right time in Right place according to the crop needs.
- ✓ Better understanding of nutrient interactions may be useful in understanding importance of balanced supply of nutrients and consequently improvement in plant growth or yields

Types of Nutrient Interactions

- **Synergistic effect** : Upon addition of two nutrients, a increase in crop yield that is **more** than adding only one separately , the interaction is positive .

Ex: 5 +5 = More than 10 type interactions

- **Antagonistic effect**: Similarly,if adding the two nutrients together produced **less yield** as compared to individual ones, the interactions is negative.

  Ex: 5 + 5 = less than 10 type of interactions

- **No interaction/ Zero interaction** : When there is no change, there is no interaction.

  Ex : 5 + 5 =10 type of interactions.

- All the three interactions among essential plant nutrients have been reported.

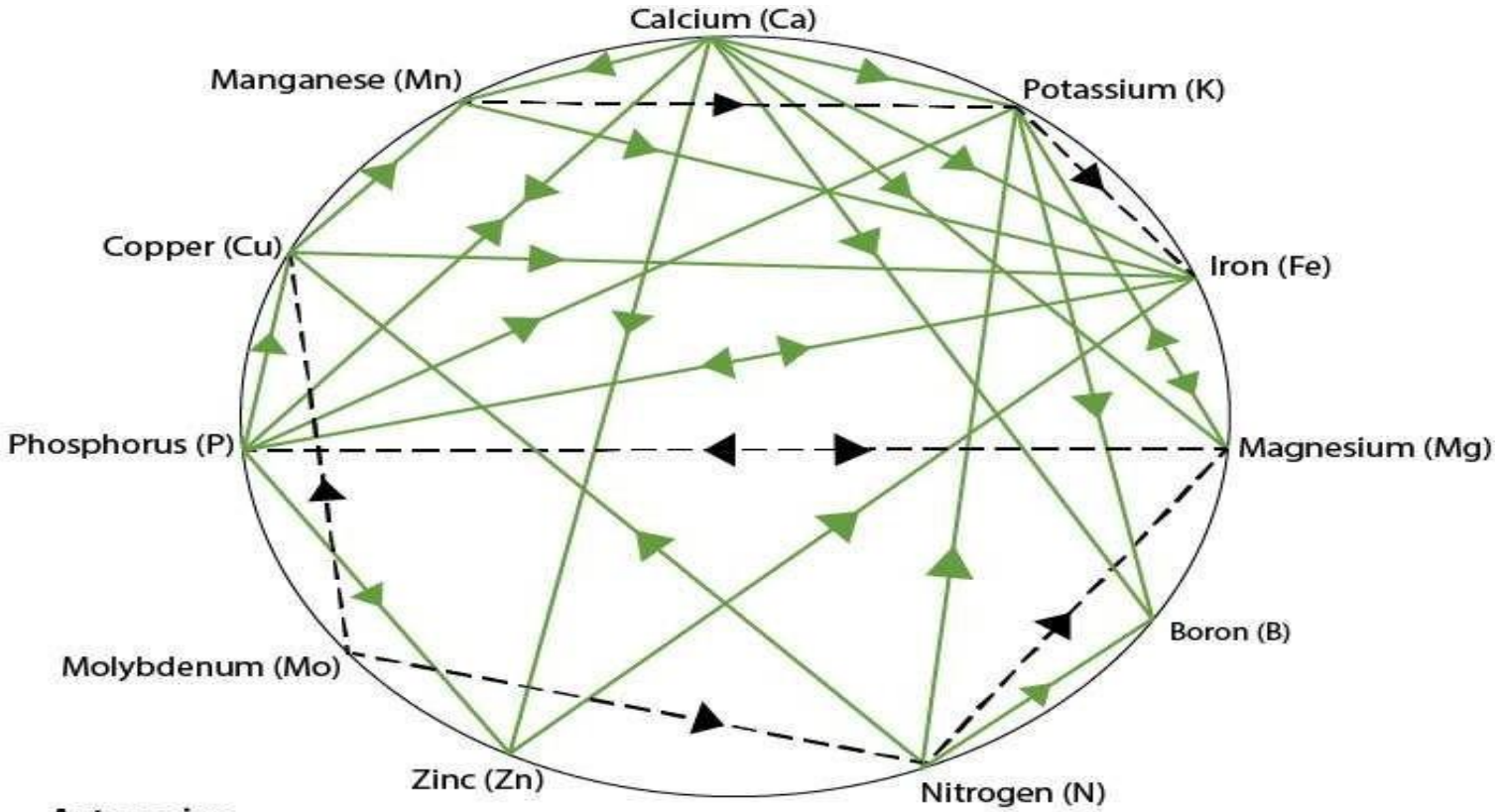
❑ However, most interactions are complex.

✓ A nutrient interacting simultaneously with more than one nutrients.

This may induced deficiencies, toxicities, modified growth responses, and/or modified nutrient composition.

INTERACTIONS

1. Interaction between the nutrients .
2. Interactions between nutrients and plant population.
3. Interaction between Nutrients and planting date
4 . Interactions between nutrients and placement
5. Interaction between nutrient placement and conservational tillage
6. Interaction between nutrients and hybrid or variety .



Antagonism

Decreased availability of a nutrient to a plant due to the action of another nutrient

Stimulation

High level of a nutrient increases the demand by the plant for another nutrient

Synergistic effects

Application of one nutrient may increase the availability of the other nutrient.

1. Application of Cl containing and acid forming N-fertilizers boost Mo uptake.
2. Application of N usually enhances micronutrient and utilization.
3. Application of Mg increases P uptake.
4. Application of P increases uptake and translocation of Mo.

- Application of NH4 – N improves P uptake.
- Application of N and P improves K uptake.
- Higher availability of Mg and NO3 –N boosts Mo uptake.

Nutrient	N	P	K	Ca		S		Mn	Zn	Cu	Mo	B	NH_4
N			*a*										
P							*a*		*a*	*a*			
K	*a*			*a*	*a*								
					a		*a*					*as*	*a*
Mg			*as*	*a*			*a*	*as*					*a*
S													
Na			*a*	*a*	*a*								
Fe				*a*	*a*			*a*	*a*	*a*			
Mn							*a*				*a*		
Zn							*a*	*a*	*a*				
Mo		*s*				*a*				*a*			
B					*a*								

Nutrient antagonism and interaction:

Nitrogen:

- When high levels of **N** induce accelerated growth rates, levels of micronutrients that would normally be marginal can become deficient.
- High soil levels of **N** can assist **P, Ca, B, Fe and Zn** but an excess can dilute these elements. Low soil levels can reduce **P, Ca, B, Fe and Zn** uptake. Ammonium N can make Mo deficiency appear less obvious.

Phosphorus:

- High levels of **P** reduce **Zn** and, to a lesser degree, **Ca** uptake. It is antagonistic to Boron in low pH soils.

- **Potassium**: High levels of K reduce Mn and to lesser extent Calcium, Iron, Copper, Manganese and Zinc uptake. Boron levels can either be low or toxic. Low levels can accentuate Iron deficiency.

- **Calcium:** High levels of Ca can accentuate Boron deficiency. Liming can decrease the uptake of Boron, Copper, Iron, Manganese and Zinc by raising soil pH.

- **Copper:** High levels of Copper can accentuate Molybdenum and to a lesser degree Iron, Manganese and Zinc deficiency.

- **Iron:** Iron deficiency can be accentuated by liming, low **K** levels or high levels of **Co, Mn or Zn .**

- **Manganese:** High levels of **Co, Fe or Zn** can accentuate **Mn** deficiency – especially repeated soil applications of Iron. Uptake can be decreased by liming or increased by Sulfur applications (because of the affects on pH)

- **Molybdenum:** Deficiencies can be accentuated by high levels of Copper and to a lesser degree **Mn**. Uptake can be adversely affected by sulfates. Uptake can be increased by phosphates and liming. **Mo** can increase **Co** deficiencies in animals.

Zinc: Uptake can be decreased by high **P** levels , liming or high levels of **Co , Fe or Mn** .

- ✓ **Zn** deficiencies are often associated with **Mn** deficiencies, especially in citrus.

ANTAGONISTICEFFECTS

If becomes excess	Becomes deficit
Ca	P
Ca and Mg	K
Ca	Mg (If ratio is more than 7 :1)
K and NH4	Mg
N,K and Ca	B
Fe and SO4	Mo
Cu, Mn, and NH4- N	Mo
Cu, Fe, and Mn	Al
P	**Zn**
N,P,K	Cu
Zn and Al	Cu
P	Mo
No3-N	Fe