

PHYTOFULVIC ACID VS MINED FULVIC ACID

MINED FULVIC ACID:

- Black powder extracted from lignite, leonardite and even oxidized coal.
- It comes from mined sedimentary material.

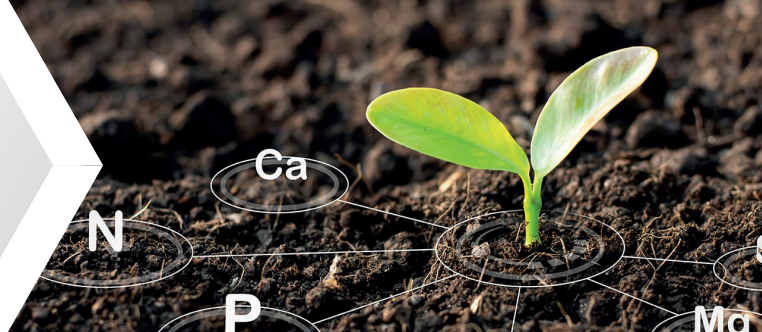
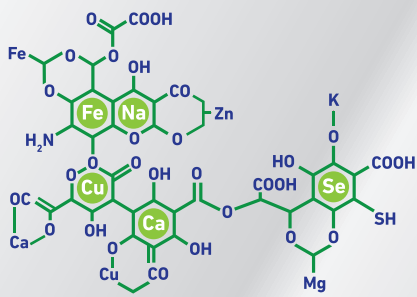
PHYTOFULVIC ACID WATER SOLUBLE POWDER

- Fine hygroscopic brown powder.
- Improve utilization and uptake of plant nutrients.
- The average molecular size of PhytoFulvic acid powder is small which means that on a mass to mass basis, it has more active binding sites, (active sites), hence a better cation exchange capacity.
- Wetting properties - PhytoFulvic acid powder significantly reduces the surface tension of water (surface tension of distilled water is 70.5 mN/m which is reduced to 28.46 mN / m in the presence of a 0.1% Phytofulvic powder solution - 59.6% reduction).
- Humectant - it is highly hygroscopic and retains/absorbs moisture. If sprayed on leaves, the surface stays wet longer. In the morning when there is moisture in the air, the moisture will be absorbed from the atmosphere and re-wetting takes place, causing nutrients and chemicals to be taken up repeatedly.



WHAT TO LOOK FOR WHEN CONSIDERING THE QUALITY AND PRICE OF FULVIC AND HUMIC ACID PRODUCTS.

- Pure Fulvic acid concentration without the minerals inherent in these products opposed to higher Fulvate concentration that includes the mineral content. The latter usually stated on labels of products misleadingly called Fulvic acid concentration.
- Dry matter content %.
- Mineral Nutrient content % and composition.
- Rand per % active, pure Fulvic Acid content and not Fulvate content.
- K, B or M REGISTRATION? What is really being sold? Fulvic/Humic acid or nutrients at very low concentrations? Note K and B Registrations are fertilizer/nutrition registrations!
- **Agribrium's PhytoFulvic powder and liquid products** are M registered raw materials as per the new Regulations of Act 36 of 1947 requirements as a pure Fulvic acid product and not for nutrients that have been added to get Potassium or Boron registrations.
- **Functional groups vs Biological activity** - there is no scientific evidence that there is any direct relationship between functional groups and crop improvement or yield (biological activity)
- **Dose response curve** - has the optimal economic dose been determined for the specific products? Note without enrichment with nutrients ie. nutrient effect versus organic component effect.



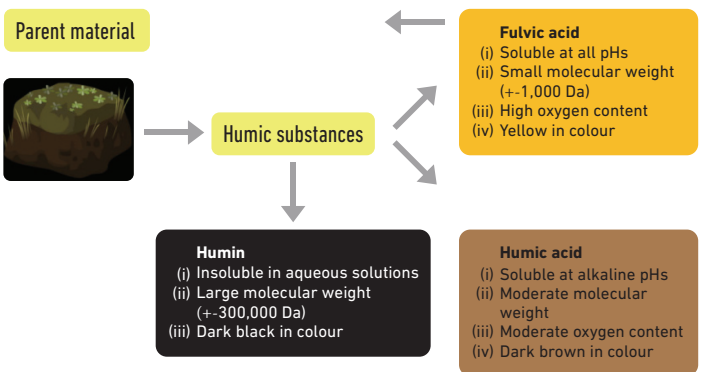
PHYTOFULVIC ACID VS HUMIC ACID

Fulvic Acid

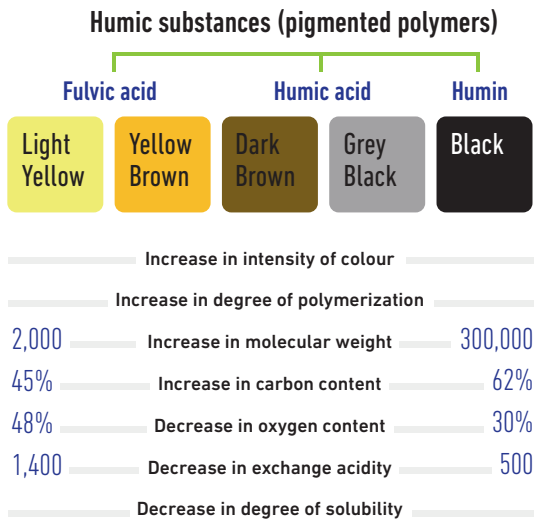
1. Mother material of PhytoFulvic acid is from a renewable natural plant source.
2. Original parent material already very small molecules - about 13000 Kilodaltons which are cut even smaller during oxidation process.
3. Fulvic acid does not "gel" due to its very small molecular structure, cannot fold back and make intramolecular bonds.
4. Many more binding levels due to smaller molecules and therefore more activity and more binding sites that can chelate / complex more nutrients.
5. Water soluble at all pH levels. No clogging of spray and irrigation equipment.
6. Miscible with fertilizer forming a homogeneous solution.
7. Miscible with all Micro elements.
8. Move more easily into the soil after application
9. Is taken up by both roots and leaves and plant can utilize both Fulvic acid and complexed cations.
10. Smuggle (carry) chelated substances into plant because plants can actively absorb the charge neutralized natural small complexes
11. Increase efficiency of applied chemicals by absorbing and transporting the complexes very quickly.
12. Both reduce leaching of nutrients in soil.
13. Smaller molecules with better availability of nutrients and usable by soil microbes.

Humic Acid

1. Mined mother material is not renewable.
2. Original parent material large molecules and after extraction still larger than 25 000 Kilodaltons and usually 100 000+.
3. Humic acids gel at concentrations higher than 26% due to larger molecules forming intramolecular bonds.
4. Activity lower than fulvic acids due to less binding sites.
5. The lower the pH drops from 11 - 12 when in solution, the more precipitated and insoluble humic acid becomes that plants cannot utilize.
6. Not miscible with fertilizer because precipitates form.
7. Not miscible with micro elements.
8. Moves more slowly or even static in soil due to molecule size.
9. Low action and effectiveness as a foliar application because applied substances must first be exchanged.
10. Due to molecular size Humic acid is not taken up directly.
11. Little improvement because no direct absorption takes place.
12. Both reduce nutrient leaching in soil.
13. Larger molecules with poor availability of nutrients and less usable by soil microbes.



POSTULATED RELATIONSHIPS BETWEEN DIFFERENT HUMIC SUBSTANCES



Chemical properties of humic substances (Stevenson 1982)