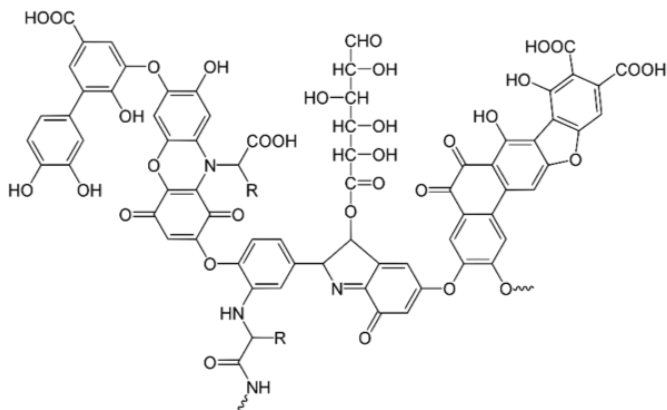


### Traditional view of formation and description

The formation of humic substances in nature is one of the least understood aspects of humus chemistry and one of the most intriguing. There are three main theories to explain it: the lignin theory of Waksman (1932), the polyphenol theory, and the sugar-amine condensation theory of Maillard (1911). Those theories are insufficient to account for observations in soil research. Humic substances are formed by the microbial degradation of dead plant matter, such as lignin and charcoal. Humic substances in the lab are very resistant to further biodegradation. The precise properties and structure of a given sample depend on the water or soil source and the specific conditions of extraction. Nevertheless, the average properties of lab produced humic substances from different sources are remarkably similar.

Humic substances in soils and sediments can be divided into three main fractions: humic acids, fulvic acids, and humin. Their presence and relative abundance are inferred by lab extraction, a process which alters their original form beyond recognition. The humic and fulvic acids are extracted as a colloidal sol from soil and other solid phase sources into a strongly basic aqueous solution of sodium hydroxide or potassium hydroxide. Humic acids are precipitated from this solution by adjusting the pH to 1 with hydrochloric acid, leaving the fulvic acids in solution. This is the operational distinction between humic and fulvic acids. Humin is insoluble in dilute alkali. The alcohol-soluble portion of the humic fraction is, in general, named ulmic acid. So-called "gray humic acids" (GHA) are soluble in low-ionic-strength alkaline media; "brown humic acids" (BHA) are soluble in alkaline conditions independent of ionic strength; and fulvic acids (FA) are soluble independent of pH and ionic strength.



Humus in nature is produced by biodegradation of tissues from dead organisms and is thus roughly synonymous with organic matter; distinctions between the two are often not precisely and consistently made.

Humic acid as traditionally produced in a laboratory is not a single acid; rather, it is a complex mixture of many different acids containing carboxyl and phenolate groups so that the mixture behaves functionally as a dibasic acid or, occasionally, as a tribasic acid. Humic acid used to amend soil is manufactured using these same well-established procedures. Humic acids can form complexes with ions that are commonly found in the environment creating humic colloids. Humic acids are insoluble in water at acid pH, whereas fulvic acids are also derived from humic substances but are soluble in water across the full range of pH. Humic and fulvic acids are commonly used as a soil supplement in agriculture, and less commonly as a human nutritional supplement.[14] As a nutrition supplement, fulvic acid can be found in a liquid form as a component of mineral colloids. Fulvic acids are polyelectrolytes and are unique colloids that diffuse easily through membranes whereas all other colloids do not.

A sequential chemical fractionation called Humeomics can be used to isolate more homogeneous humic fractions and determine their molecular structures by advanced spectroscopic and chromatographic methods. Substances identified in humic extracts and directly in soil include mono-, di-, and tri-hydroxy acids, fatty acids, dicarboxylic acids, linear alcohols, phenolic acids, terpenoids, carbohydrates and amino acids.

### Not all Fulvic and Humic are created equally

All humic substances (soils, clays and shale) contain minute quantities of fulvic acids which are a particular type of humic acid. Fulvic acid molecules contain more oxygen than other humic acids. Fulvic acids are especially important because of their ability to interact with silica, chelate metal ions and form reactions with various other organic or inorganic compounds.

Fulvic acids can be found in clay, soils, humic shale, streams, oceans and lakes. The greatest concentrations appear in rare fulvic prehistoric plant deposits. These deposits are located near coastal areas with variations in chemical composition depending on location, climate, etc.

The yellow-brown color of liquefied humus in lakes, rivers, and coastal waters is almost entirely due to the presence of naturally occurring, low-molecular weight fulvic acid chelates. These consist of various particle sizes, so small they are difficult to measure accurately. Substantial amounts of calcium, magnesium, potassium, etc., are brought into solution by the action of fulvic acid on mica, clay, and other mineral-rich deposits.



Recent scientific research in biochemistry, botany and agriculture has changed our understanding of how soil chemistry works and why fulvic acids are so important. For example, it was once thought that the chelation of metallic minerals into chelated minerals was accomplished entirely by the plant's interior biological processes. We know now that fulvic acids (which are strong chelators of metallic minerals) are partly responsible for micronizing metallic minerals prior to absorption by plants and micro-organisms.

Fulvic acids have a particularly strong affinity for reaction with iron. Soils rich in fulvic acids increase the absorption of iron by plants. Deposits containing high amounts of colloidal/ionic hydrophilic iron bound to fulvic acid contain greater amounts of other trace minerals. These interactions help to increase soil concentrations of metal ions and silica to levels that are far greater than once theorized. Studies conducted with fulvic acids suggest that such interaction may play a role in the synthesis of new minerals by allowing the complexed, dissolved metals, and silica to form new combinations. That's exciting news!

### **New Mexico Humates**

#### **100% Genuine New Mexico Fulvates and Humates | About 75 Million Years in the Making**

Over the past decades, we have supplied the agricultural industry with the highest quality humates, mined from premium New Mexico

geologic deposits, in the Upper Cretaceous Fruitland Formation, in the San Juan Basin.

New Mexico humates are noted for being among the best in the world!



### **Mines in New Mexico Clod Buster Mine**

The Clod Buster Mine, operated by Farm Guard Products, Inc., is located in the northwest quarter of sec. 9, T. 19 N., R. 1 W., along the old highway between Cuba and La Ventana (Fig. 1). The company holds leases on about 900 acres of Federal land at that location, and other acreage nearby. The mining operation began in 1965. Production is variable and depends largely on spot sales currently. Capacity is 80 to 100 tons per day. The humate-rich bed being mined is near the top of the Upper Cretaceous Menefee Formation (Figs. 2 and 3), associated with the persistent coal zone at the stratigraphic position of the San Miguel (Padilla) coal mines about 1.5 miles to the north. The humate-rich bed is similar lithologically to the brown "underclay," rich in plant

fragments, that underlies most San Juan Basin coals. It differs from a typical underclay in that it is not bleached. The bed lies a few feet beneath a light grayish-brown sandstone unit assigned by Dane (Sears, Hunt, and Dane, 1936) to the La Ventana Sandstone Member of the Mesaverde Formation; current usage, however, considers it to be the La Ventana Tongue of the Cliff House Sandstone of the Mesaverde Group (Woodward and others, 1973). The exposure is in an east-facing cuesta along the eastern rim of the San Juan Basin. The strata in this vicinity dips 8 to 11 degrees in a nearly due west direction and the mine itself is in a gap in the cuesta. Humate is surface mined from beneath shallow overburden by a front-end loader and crushed. It is shipped either in bulk or in sacks of 50- or 80-pound capacity. The material shipped is guaranteed to contain 15 percent or more humic acid. Some bulk shipments are loaded into railroad cars at Bernalillo, and some humate is liquified at the mine and shipped in that form. Reserves on the company's holdings, based on 50 percent recovery, have been estimated at 155 million tons. The bed averages nearly 20 feet in total thickness, including sandstone stringers that are discarded in mining. Various clay minerals including kaolinite, illite, mixed layer illite-montmorillonite, possibly some montmorillonite [Na variety(?)] and chlorite have been identified in one sample obtained from the pit at the Clod Buster Mine (C. T. Siemers, written commun., 1974).

### Tenorio Mine.

The Tenorio Mine, in sec. 4, T. 14 N., R. 1 E., about 8 miles southwest of San Ysidro (Fig. 1), has been operated by Humus Organic Products, Inc. for about 8 years. The company holds leases on 640 acres of fee land at the mine site, and on 80 acres of Zia Pueblo lands nearby. Production has been increasing steadily; 1,200 tons were shipped in 1971, 2,400 tons in 1972, and 2,750 tons in 1973. Production for 1974 is projected at over 6,000 tons. The Tenorio Mine is also in the coal-bearing upper part of the Menefee Formation, but at a considerably higher stratigraphic position than that of the Clod Buster Mine. The Tenorio humate bed is in that part of the Menefee section which is the landward equivalent of the La Ventana Tongue of the Cliff House Sandstone (Woodward and others, 1973; Shomaker, Beaumont and Kottowski, 1971). The fee leases are estimated by the company to contain proven reserves of 3,871,200 tons, based on a thickness of 15 feet. Reportedly, the thickness of the humate-bearing beds ranges from 17 to 28 feet. Additional reserves of some 10 million tons are thought to be potentially present. The reserve estimates assume surface mining with little or no overburden being removed. The 80-acre Zia Pueblo lease is estimated to contain 35 acres of exposed humate material. Using an 80-foot thickness, 4,616,400 tons of proven reserves were estimated. The actual thickness is said to range from 85 to 120 feet. An additional 2,580,800 tons is thought to be present under more than 20 feet but less than 50 feet of overburden. Humate has been mined from less than 2 acres, all in the fee acreage, during several years of intermittent production. The run-of-mine material is trucked to Bernalillo, where it is crushed in a hammermill at the company's preparation plant.

### Uses of Fulvic and Humic products GTX Organic Food Grade

GTX Organics is a specialty manufacturer that develops and supplies natural ingredients that are organically registered with Washington State Department of Agriculture (WSDA) for organic food production, providing for a variety of customer requirements worldwide. Our proprietary organic extraction (brewing) and pre-concentration process produces fulvic acid in liquid and nearly pure powder forms. Our brand of fulvic and humic acids include GTX Gold-L, Alkaline Gold and Black Fulvic Acid equivalent dry powders have been evaluated according to the USDA National Organic Program standards by WSDA. The organic fulvic acid or may be further formulated into specialty natural base products for our customers on a confidential basis. GTX's raw natural ingredients are obtained from known high quality sources with the highest control standards to ensure manufactured products are of the highest purity.



Figure 1. Locations of humate mines and areas likely to contain commercial humate deposits, northwestern New Mexico and southwestern Colorado.

- 100% Food Grade Organic Fulvic/Humic Acid from Natural Fulvates/Humates Produced in the USA.
- All our products are Organic, and Kosher certified for the food grade ones. Organically registered with the WSDA for organic food production.
- Fulvic Technologies Fulvic Acid Powder is organically extracted liquid fulvic/humic acid from raw natural humates & converted into 100% water soluble powder. It is a rich dark to black natural powder ingredient containing 77 + Trace Minerals that can be used in many nutritional & medicinal applications for health & wellness.
- Solubility: 100% soluble in water & other aqueous solutions.
- Taste: Slightly alkaline to no taste at all.
- Moisture: Between 2 to 5%
- Color: Absolutely, no artificial colors added
- Preservatives: None
- pH in Water: Alkaline

Storage Conditions: Can be stored in temperatures up to 100 F. Some powders tolerate exposure to temperatures above 200 F.

Regulatory: Black Fulvic Acid Powder is approved by the WSDA & Canadian National Organic Food Programs for use in organic food production. Also, the liquid is registered for organic food production under USDA National Organic Standards (7 CFR Part 205), the Canadian Organic Food Standards, the European Union (EEC 2092/91, Japanese Agricultural Standards (JAS).

### 3rd Party Testing

For over 10 years Fulvic and Humic raw materials and finished goods are tested by Motzz Laboratory (3rd party). Motzz Laboratory strives to be a competent partner assisting engineers and growers with their analytical needs.

Agricultural testing – soil and plant testing for nutrients necessary to grow crops. Testing procedures according to acceptable published methods.

Environmental testing – analysis on EPA regulated solid waste, drinking water, sludge, contaminated soils etc. Closely adhere to ADEQ requirements and tested according to ADHS methods.

Material testing – Chemical testing of soil for construction and landscape purposes. Chemical testing methods according to ASTM and department of transportation requirements.

**Motzz Laboratory, Inc. 3540 E Corona Ave.  
Phoenix AZ 85040 P: 602-454-2376 F:  
602-454-9243**

## Scientific Advisors

### Dr. Liza Leal

Dr. Leal knows something about pain. She lives with rheumatoid arthritis, a chronic, painful inflammation of the joints. Dr. Leal began experiencing searing, persistent leg pain during her junior year of medical school. She completed medical school and began her residency in a wheelchair. Today, as a family physician and one of the few physicians certified in Pain Management, Dr. Leal is out of the wheelchair thanks to a comprehensive approach to pain management through understanding the natural ways to reduce inflammation. Her personal experience provides a unique perspective that strengthens her commitment to treat patients with compassion, understanding, and education.

Of the 1000's of patients seen each year, I hear great unsolicited feedback. I see people's lives improve because they are choosing to take their daily habits to a new level, like drinking alkaline water. Fulvic and Humic is mineral infused with elements that contain healing properties and anti-inflammatories. Every drop provides minerals, electrolytes, is sugar free, and tastes great. That's why I chose Fulvic and Humic products for me and my family of patients. So, I encourage 'Choose to be well!'. Reduce inflammation, increase your bodies pH, and help your body be the best it can be



## Norbert Chirase, PhD.

*After receiving a PhD in Nutrition from Texas A&M University, College Station, TX, Dr. Chirase spent over 16 years in research and teaching (academia) and the last thirteen (13) years in nutritional consulting and researching Fulvic and Humic acid production technologies and their applications for health and wellness. Twelve of these years involved teaching appointments in addition to an extensive research program in the area of nutritional enhancement of the immune system using organic bioactive ingredients. As interim program leader for four years, I directed the Texas A&M University Beef Cattle Research facility in Amarillo, TX. Several research staff, graduate and undergraduate students helped with the management of privately funded and government funded grants research projects. Grant funds received from these projects supported salaries of research technicians, graduate students, secretaries and others working on these projects.*

*My research career also involved new product evaluation research for some of the world's biggest pharmaceutical companies: Eli Lilly (Elanco), Roche Animal Health, Pfizer Animal Health, Boehringer Ingelheim Vetmedica, Schering-Plough, Merck & Company, etc. The discoveries made for some of these companies resulted in some of the leading brands of products in animal agriculture and human applications today.*

*Dr. Chirase found intriguing biochemical properties with humic substances and their extracted derivatives through his animal research. During this research period, Dr. Chirase observed differences in biochemical properties among various manufactured fulvic acid and humic acid products. In order to produce the highest quality fulvic acid derived products at the lowest manufacturing cost, a liquid and powder fulvic acid production facility was established in Amarillo, Texas. A few years after opening the manufacturing facility, Dr. Chirase invented the infusion of fulvic and humic acids into drinking water for human health and wellness. This was encouraged by his first formulation which achieved the rank of Highly Recommended in the Best Newcomer Brand or Business category at the 7th Global Bottled Water Congress (2010) Gleneagles, Scotland.*

*Dr. Chirase is associated with various humic and fulvic acid companies around the world and has introduced several patented products now in use. Dr. Chirase is also a member of the International Humic Substances Society (IHSS), Humic Products and Trade Association (HPLA), actively involved with humic and fulvic acid research in biological systems.*

Dr Norbert Chirase, a Ghanaian entrepreneur based in the USA has received the US President's "E" award (2018) for contributing to the expansion of the USA exports.

Mr. Wilbur Ross, the U.S. Secretary of Commerce, presented the award to the GTX Technologies LLC with the President's 'E' Award for Exports at a ceremony in Washington, D.C.



The President's 'E' Award is the highest recognition any U.S. entity can receive for making a significant contribution to the expansion of U.S. exports

A congratulatory letter to Dr Chirase and his GTX Technologies Company, said: 'GTX Technologies has demonstrated a sustained commitment to export expansion. The 'E' Awards Committee was very impressed with GTX Technologies' significant percentage of export sales.

The company's innovative development of products for different industries was also particularly notable. GTX Technologies' achievements have undoubtedly contributed to national export expansion efforts that support the U.S. economy and create American jobs.'

GTX Technologies is a specialty manufacturer that develops and supplies natural ingredients that are organically registered with the USDA for organic food production, providing 'organic solutions' for a variety of customer requirements worldwide.

The products are used to enhance drinking water, beverages and skin care products, as well as for soil amendment.

Dr Chirase, the CEO of GTX Technologies told the GNA in a telephone interview that that, 'Exporting is an important part of our sales. Buyers and

consumers in foreign markets want quality products made in the United States, and we are honored to receive the 'E' Award.'

He said in total, Secretary Ross honored 43 U.S. companies and organizations (25 manufacturing companies) from across the country with the President's 'E' Award for their role in strengthening the U.S. economy by sharing American ingenuity outside of US borders.

He explained that U.S. companies were nominated for the 'E' Awards through the U.S. Commercial Service, part of the Department's International Trade Administration.

He said with offices across the United States and in embassies and consulates around the world, the International Trade Administration lends its expertise at every stage of the exporting process by promoting and facilitating exports and investment into the United States; administering Anti-Dumping and Countervailing Duties orders; and removing, reducing, or preventing foreign trade barriers.

U.S. exports totaled \$2.33 trillion in 2017, accounting for 12 percent of U.S. gross domestic product. Exports supported an estimated 10.7 million jobs nationwide in 2016, according to the most recent statistics from the International Trade Administration.

Sources: GTX Organics; Motzz Laboratory; Humates.com; modernghana.com; webmd.com and Fulvicacid.com

**durt**<sup>TM</sup>

