

The image features two elegant wine glasses filled with a dark, rich brown liquid, which are the humic substances being discussed. They are placed on a rustic wooden plank. In the foreground, there is a small pile of dark, crumbly soil and several large, vibrant green leaves, possibly from a plant like Salvia, which are associated with the natural origin of humic substances. The background is a soft, out-of-focus green, suggesting an outdoor setting.











# HUMIC SUBSTANCES

**MPHARM SIMONA HRÍKOVÁ**

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Review

## Humic Substances as a Versatile Intermediary

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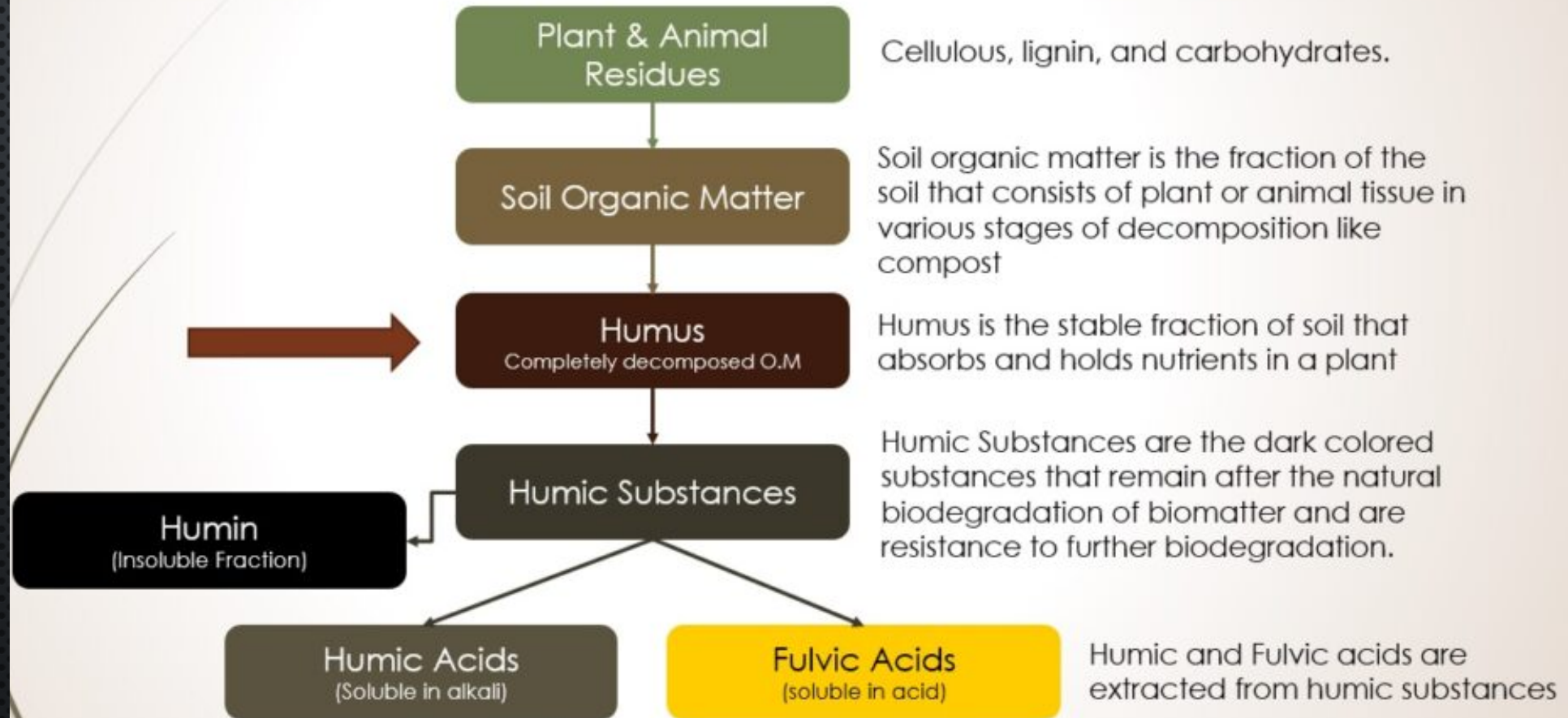
Versions Notes

### Abstract

Humic substances are organic ubiquitous components arising in the process of chemical and microbiological oxidation, generally called humification, the second largest process of the carbon cycle. The beneficial properties of these various substances can be observed in many fields of life and health, whether it is the impact on the human organism, as prophylactic as well as the therapeutic effects; animal physiology and welfare, which is widely used in livestock farming; or the impact of humic substances on the environment and ecosystem in the context of renewal, fertilization and detoxification. Since animal health, human health and environmental health are interconnected and mutually influencing, this work brings insight into the excellence of the use of humic substances as a versatile mediator contributing to the promotion of One Health.

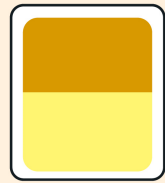
**Keywords:** humic substances; humic acids; fulvic acids; human health; animal health; environment; One Health

# Humic Substances Formation



# HUMIC SUBSTANCES

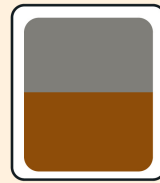
## Colour and Solubility



### Fulvic Acids

Light yellow to light brown

Soluble in water  
under all pH conditions



### Humic Acids

Dark brown to grey black

Not soluble in water  
under lower pH, but  
soluble at higher pH

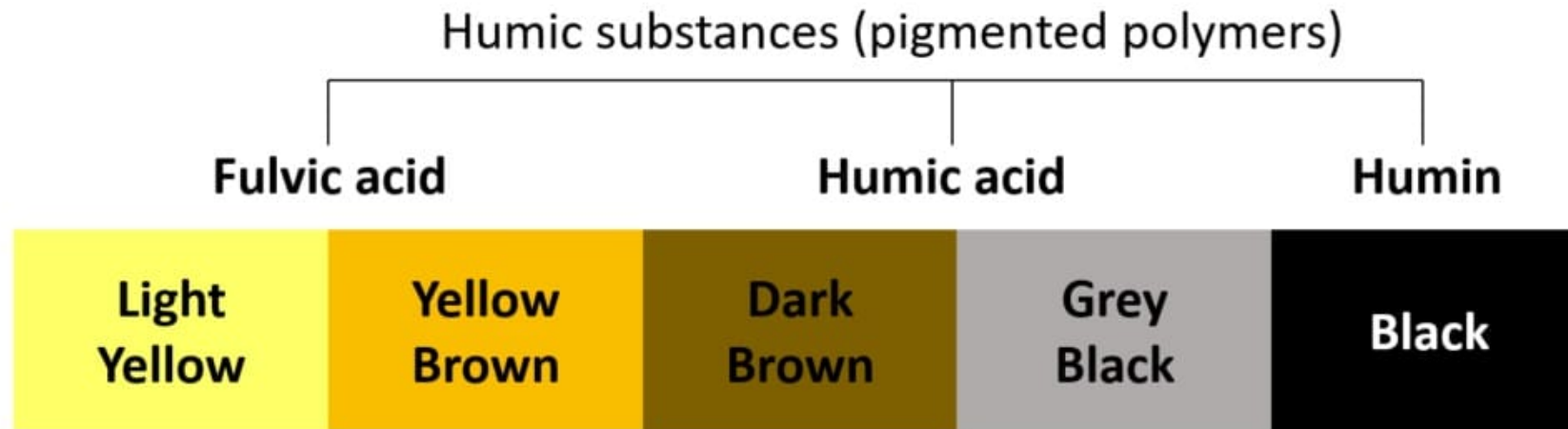


### Humins

Black

Not soluble in water  
under all pH conditions

## POSTULATED RELATIONSHIPS BETWEEN DIFFERENT HUMIC SUBSTANCES



————— Increase in intensity of colour —————

————— Increase in degree of polymerization —————

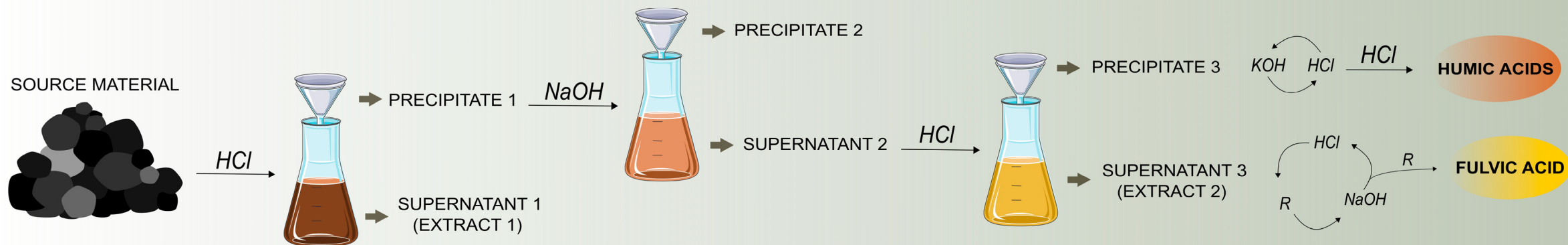
2,000 ————— Increase in molecular weight ————— 300,000

45% ————— Increase in carbon content ————— 62%

48% ————— Decrease in oxygen content ————— 30%

1,400 ————— Decrease in exchange acidity ————— 500

————— Decrease in degree of solubility —————



# Humic Acid Effects



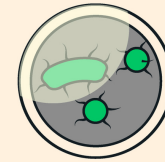
## Physically

*Improve soil structure.  
Increase soil aeration.  
Reduces the risk of soil erosion. increase water holding capacity and soil nutrient holding capacity*



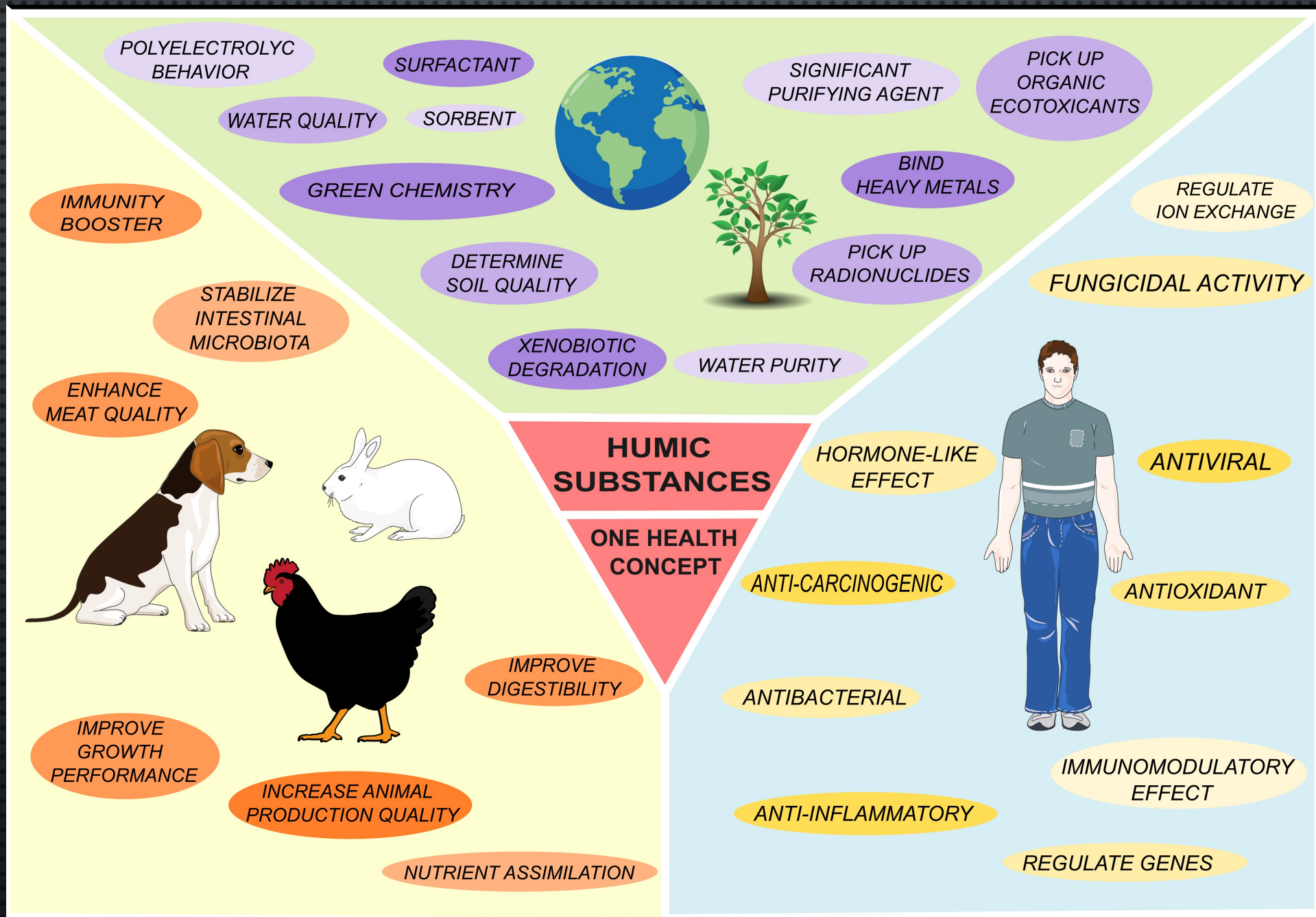
## Chemically

*Change the fixation properties of the soil.  
Reducing soil toxicity.  
Increase fertilization efficiency. Main source of nitrogen (N), phosphorus (P), and potassium (K).*



## Biologically

*Stimulates soil microbiological activity.  
Increase plant membrane permeability, respiration, photosynthesis, and cell elongation. Produce growth hormones.*



# Dietary supplements containing humic substances intended for humans

| Product Name                          | Content (mg) |     |     | Application Form | Purpose (Based on Manufacturer Information)  | Producer                | Country of Origin |
|---------------------------------------|--------------|-----|-----|------------------|--|-------------------------|-------------------|
|                                       | HA           | FA  | Hu  |                  |  |                         |                   |
| Detox Fulvic/Humic Foot Soak          | 800          | 50  | -   | powder           | Helps absorb minerals; destroys toxins; supports the immune system; improves and softens the skin, good for blood circulation; for the care of tired muscles.  | The Natural Edge        | Australia/Canada  |
| FULVIC                                | 75           | 53  | -   | capsule          | Rich source of natural minerals; traces elements, fulvic, humic and amino acids used for mineral supplementation that supports general health.   | The Natural Edge        | Australia/Canada  |
| Fulvic Minerals                       | -            | 25  | -   | suspension       | Supports gut health; strengthens immune function; boosts nutrient absorption; optimizes cellular function; improves energy levels; supports brain health; fights free radicals; supports detoxification.   | Touchstone Essentials   | USA               |
| Fulvic/Humic Minerals, Inner Vitality | 2.2          | 8.3 | -   | suspension       | Increases energy; improves vitality; mineral supplement.   | Morning Star Minerals   | USA               |
| HUMAC® Nativ                          | 460          | -   | 180 | capsule          | Absorption of toxins; anticarcinogenic effect; antioxidant activity; effect on iron deficiency, macro, micro and trace elements supplementation.   | HUMAC®                  | Slovakia          |
| Humic Acid Membrane Active            | 375          | -   | -   | capsule          | Immune system support; defends the body against toxins and foreign invaders and encourages a healthy immune response.  | Allergy Research Group® | USA               |
| HUMICIN Pure                          | 50           | 75  | -   | capsule          | Strengthens the immune system; reduces inflammation.   | Humicin®                | Hungary           |
| HUMINIQUUM                            | 50           | 120 | -   | capsule          | Antioxidant effects; significantly strengthens the immune system; has antiviral effects, binds toxins; helps with hair loss; helps with obesity; helps with fatigue; helps with skin problems; increases enzyme activity; increases permeability of cell walls; acts against anaemia, energizing effects; support regeneration after diseases; help with osteoporosis.     | HYMATO PRODUCTS Kft.    | Hungary           |
| HUMINIQUUM Sirup                      | 20           | 48  | -   | syrup            | Antioxidant effects; significantly strengthens the immune system; has antiviral effects, binds toxins; helps with hair loss; helps with obesity; helps with fatigue; helps with skin problems; increases enzyme activity; increases permeability of cell walls, acts against anaemia; energizing effects; support regeneration after diseases and helps with osteoporosis. | HYMATO PRODUCTS Kft.    | Hungary           |
| Jarrow Shilajit Fulvic acid complex   | -            | 250 | -   | capsule          | Works with Co-Q10 in the mitochondria to support energy production in brain and muscle tissues during exercise.  | Jarrow Formulas         | USA               |
| Mineral Blend Fulvic-Humic            | 2.2          | 0.5 | -   | suspension       | Supports a normal strong immune system; promotes digestive well-being; healthy cognitive function; restful sleep and assists the body's normal ability to detoxify tissues.  | Vital Earth Minerals    | USA               |
| Mumijo                                | 60           | 250 | -   | capsule          | Has a positive effect on the gastrointestinal tract; immune system; bones; fertility and brain.  | Natu Gena               | Germany           |
| Refined Fulvic Acid                   | -            | 900 | -   | powder           | Helps to absorb and use other nutrients such as microbiota/probiotics, phytonutrients, fatty acids and minerals; powerful natural free radical scavenger and antioxidant; neuroprotective; antimicrobial and anti-inflammatory properties.   | Mark Nature             | China             |
| Trace Minerals Ionic Fulvic Acid      | -            | 250 | -   | suspension       | Helps support and maintain healthy functions in the body; including the following: digestion, pH balance, energy production, hydration, cellular integrity, enzyme activity, muscle endurance and stamina.   | Trace Minerals          | USA               |

HA = Humic acids; FA = Fulvic acids; Hu = Humins; Values of HA, FA, Hu are expressed in; mg·mL<sup>-1</sup> (suspension and liquid form), mg·g<sup>-1</sup> (powder form) and mg/capsule (capsule form).



# Humic substances based products available on the market intended for administration to animals.



| Product Name                                    | Content [%] |       |    | Form          | Target Species                                      | Purpose (Based on Manufacturer Information)   | Producer     | Country of Origin |
|---|-------------|-------|----|---------------|---|---|--------------|-------------------|
|   | HA          | FA    | Hu |               |   |   |              |                   |
| HUMAC® Natur AFM                                | 65          | 5     | -  | powder        | dog, cat  | Supports the normal functioning of the immune system; promotes good health of the digestive system; supplements proper nutrition with minerals and trace elements; positively affects the condition, stress and appearance of pets; supports the normal functioning of the metabolism; supports the cleansing of the body from harmful substances.  | HUMAC®       | Slovakia          |
| HUMAC® Natur AFM Liquid                         | 15          | 5     | -  | suspension    | all animal species                                  | Supplement in the treatment of various health problems, such as inflammation, digestive disorders, allergies, skin diseases, etc.; they improve the absorption of nutrients and minerals (a factor improving feed conversion); detoxification of the body; maintains various normal bodily functions such as immunity, digestive health, stable pH, normal stress levels, etc.  | HUMAC®       | Slovakia          |
| HUMAC® Natur —veterinary preparation            | 62          | -     | -  | powder        | all animal species                                  | Detoxification of exogenous and endogenous poisons; stabilization of intestinal and rumen microflora; supports of the immune system; potentiation of the effects of probiotics, activation of metabolism; prevention of digestive disorders (diarrhoea).  | HUMAC®       | Slovakia          |
| HUMAC® Natur AFM for birds                      | 65          | 5     | -  | powder        | birds   | Supports the normal functioning of the immune system; supports good digestive system health supplements the proper nutrition of birds with minerals and trace elements in chelate bonds has a positive effect on the condition, appearance/plumage/and stress of the birds; supports the normal functionality of the metabolism; supports the cleansing of the body from harmful substances.  | HUMAC®       | Slovakia          |
| HUMAC® Natur AFM Liquid for bees                | 15          | 5     | -  | suspension    | bees  | Supports the normal functioning of the metabolism of bees and protects them from metabolic disorders; binds toxins, other toxic or sprayed substances, PCB, dioxins and heavy metals, etc., which are subsequently eliminated by the digestive system; supports the normal functioning of the immune system and limits the occurrence of inflammation; supplements the proper nutrition of bees with minerals and trace elements; positively affects the condition and appearance of bees.  | HUMAC®       | Slovakia          |
| HUMAC® Natur AFM Liquid for horses              | 15          | 5     | -  | suspension    | horses  | To help in the treatment of various acute health disorders, such as food poisoning, weakened immune system, loss of appetite, etc. and used for prevention.   | HUMAC®       | Slovakia          |
| HUMAC® Natur —veterinary preparation for horses | 62          | -     | -  | powder        | horses  | Detoxification of exogenous and endogenous poisons, heavy metals and toxins in animal feed (microbial, fungal toxins, ammonia, PCBs, dioxins, bacterial toxins, viruses...); stabilization of intestinal microflora, prevention of digestive disorders, activation of metabolism; support of the immune system, affects the condition and appearance of the animals, health of the hooves, reduction of stress and general well-being of the animals; supplements the proper nutrition of horses with minerals and trace elements in chelate bonds. | HUMAC®       | Slovakia          |
| HUMAC® Multi LISAL                              | 6.5         | -     | -  | salt lick     | horses, donkeys, cattle, sheep, goats, ratic animal | Preventively protects animals from metabolic disorders (mainly diarrhoea), limits the occurrence of inflammation and supports the immune system; stabilizes the pH in the digestive tract, positively influences the activity and composition of the intestinal microflora, stimulates the production and activity of pancreatic enzymes; binds microbial toxins, fungal toxins and other toxic substances (ammonia, PCBs, dioxins, pesticides, heavy metals, etc.), which are then excreted in the faeces from the animal's body.                  | HUMAC®       | Slovakia          |
| Moorkur liquid                                  | 20          | -     | 21 | powder        | dogs, cats, birds, rodents, horses, small animals   | Undeclared.   | NatuVerde UG | Germany           |
| HumicFed  | 60–70       | 10–20 | -  | powder/flakes | poultry, fish                                       | Forms a somewhat protective film on the mucosa cells of the intestine; reduces the absorption of toxic substances; has the distinct property to absorb toxins from proteins, toxic residues and various heavy metals; stabilizes the intestinal flora, fixes micro-organisms, toxins and harmful substances in animal feed promote growth and stimulate the immune system.  | Ki-HUMIC     | China             |
| Sodium Humate                                   | 70          | -     | -  | powder        | poultry   | Forms a kind of protecting film on the mucosa cells of the intestine; reduces the absorption of toxic substances; has the distinct property to absorb toxins from proteins, toxic residues and various heavy metals; stabilizes the intestinal flora; fixes micro-organisms, toxins and harmful substances in animal feed; promotes growth and stimulate the immune system.   | Mark Nature  | China             |
| PrimeHumic                                      | 50          | -     | -  | powder        | farm animals  | Promotes gut health; promotes the development of the intestinal structure; protects the intestine against harmful influences; promotes vitality; promotes the absorption of nutrients; improves overall health; helps to remove heavy metals and toxins.  | BioAg Europe | Netherlands       |
| PrimeHumic Liquid                               | 52          | 12    | -  | liquid        | farm animals  | Promotes the immune system; nourishes and protects skin and fur; nourishes and protects skin and fur; promotes the absorption of nutrients; promotes intestinal health; improves feed conversion; less intestinal infection.  | BioAg Europe | Netherlands       |
| PrimeFulvic                                     | -           | 6     | -  | liquid        | farm animals  | Promotes feed uptake; reduces stress level, enhances strength and energy; supports overall animal health.   | BioAg Europe | Netherlands       |

HA = Humic acids, FA = Fulvic acids, Hu = Humins.



# Humic substances for use in agriculture, aquaculture, as fertilizers, soil enhancers and adsorbents

| Product Name                   | Content [%] |     | Form   | Purpose (Based on Manufacturer Information)  | Producer                   | Country of Origin |
|--------------------------------|-------------|-----|--------|--|----------------------------|-------------------|
|                                | HA          | FA  |        |  |                            |                   |
| Bio Fulvic Acid                | -           | 95  | powder | Enhances drought resistance of crops; increases activity of various enzymes and content of chlorophyll; regulates and stimulates crops to grow; increase their quality and yield 10–15%; foliar fertilizer; flush fertilizer; chemical pesticides additives, has obvious synergism.  | Mark Nature                | China             |
| Boost Fulvic                   | -           | 3   | liquid | Foliar spray; low pH liquid fertilizer; micronutrient enhancer.  | Sustain Seed + Soil        | USA               |
| FULVAGRA® Liquid 25            | 1           | 17  | liquid | Increases the germination of seeds and supports root development; acts as natural complexing agent and increases fertilizer use efficiency in the soil and promotes nutrient uptake by plants; stimulates vigorous root development; increases the yield and improves plant quality; increases the cation exchange capacity in soil; stimulates enzymatic activity and increases the plant's own defences against abiotic stress factors; promotes the collection and transport of micronutrients contained in leaf fertilizers; acts as an antioxidant against free radicals and thus prevents cellular damage.   | Humin Tech                 | Germany           |
| GHP DRY HP—POWDER              | 85          | -   | powder | Improves soil structure; improves the quality of soil; aids nutrient uptake; enhances the growth of soil organisms; improves nutrient uptake by plants.  | Global Humic Products Ltd. | Canada            |
| GHP LIQUID F —LIQUIFIED FULVIC | -           | 1.5 | liquid | Improves nutrient uptake by leaves.  | Global Humic Products Ltd. | Canada            |
| HS®-300BIO BASIC               | 22          | 6   | liquid | Improves fertilizer efficiency; promotes soil structure; reduces soil erosion; increases and secures yields and qualities; increases biomass production; binds CO <sub>2</sub> in soil.  | Humin Tech                 | Germany           |
| HUMAC® Agro                    | 62          | -   | powder | Binds toxic metals, PCBs, dioxins, pesticides, herbicides and other toxic compounds in the soil; reduces the content of toxic substances in plant production products; supplies organic carbon to the soil; retains water in the soil (1 kg of preparation retains up to 740 mL of water); improves soil structure; adjusts soil pH; reduces the need for mineral fertilizers by up to 50%; improves the use of mineral substances from the soil by up to 70%; supplies the soil with all naturally occurring macro, micro nutrients and trace elements; supports the growth and reproduction of soil bacteria and useful soil microorganisms; significantly increases the growth of the root system of plants, thereby increasing the yield of cultivated plants and soil fertility.  | Humac®                     | Slovakia          |
| HUMAC® Welfare                 | 45          | 5   | powder | For use in bedding and manure; binds emission gases (ammonia, methane, hydrogen sulphide, carbon dioxide), residues of toxic substances, microbial poisons, fungal toxins and other compounds poisonous to the organism (PCBs, dioxins, heavy metals, residues of pesticides, herbicides, etc.); protects housed animals from diseases, especially damage to the mucous membranes of the respiratory tract and conjunctivae; reduces hoof diseases; limits the hatching of fly larvae; significantly reduces the humidity of the litter; adjusts the pH of manure to acidic, or neutral (up to pH 7), when ammonia in manure occurs mainly in the form of a stable ammonium ion (NH <sub>4</sub> <sup>+</sup> ), while in an alkaline environment (pH above 7) it quickly changes to volatile ammonia; significantly enriches manure, poultry droppings, etc. 0 nutrients contained in humic acids and nitrogen by absorption of ammonia; creates a high-quality, highly effective fertilizer with a natural stimulator of soil fertility, thereby improving the economic effect for the farmer in both animal and plant production; suitable for large farms: cattle, pigs, poultry, sheep, goats, rabbits, birds, small animals. | Humac®                     | Slovakia          |

|                                   |       |       |               |  |             |          |
|-----------------------------------|-------|-------|---------------|--|-------------|----------|
| Humasol Liquid Humic Acid Extract | 6     | -     | liquid        | For use in organic agriculture and safe for all crops including vegetables, herbs, nuts, fruits, berries, ornamentals, trees and shrubs.   | Humasol     | USA      |
| Humic Fulvic Acid                 | 60    | 55    | powder        | Soil conditioner; improves soil structure; increases ion exchange capacity of soil; fertilizer efficiency promoter; enhances nutrients uptake and increases the content of humus in soil; prevents soil from contamination of heavy metallic ions as well as other harmful matters; enhances solubility in hard water; plant growth stimulant; promote root development and stimulates seed germination; enhances nutrient uptake by combining nutrients and humic acids and keep well-balanced nutrition; enhances the resilience of crops (cold, drought, pest, disease and topping resistance); increases yield and improves quality of plants; improves the effectiveness of pesticides.   | Mark Nature | China    |
| HumicFed                          | 60–70 | 10–20 | powder/flakes | Removes toxic metals and their ions from wastewaters; an adjunct in dissolved air flotation cells to assist in the removal of trace amounts of grease, oil, liquid organics and suspended matter; a coagulant aid to be used in conjunction with water-soluble polymeric flocculants for removal of soluble organics; fluid loss additives in certain types of organic liquids to prevent seepage from lagoons or pit containment areas.   | KHumic      | China    |
| HumiFirst WG                      | 53    | 12    | powder        | Powerful root stimulant and increases root length and biomass; increases the quantity of secondary (hair) roots that absorb nutrients and water; increases plant resistance to hydric and drought stress; improves the physical, chemical and biological characteristics of soil; increases aggregation of soil; increases recovery of nutrients, in particular phosphorus; increases soil wettability; increases root/shoot growth; increases microbial activity in soil; immediates efficacy and greater speed of action compared to other soil conditioners.  | Tradecorp   | Spain    |
| Humistar                          | 12    | 3     | liquid        | Plants: increases white roots improves nutrient uptake and plant vigour; improves flowering; increases resistance to disease; soil: better uptake of phosphorus and micro elements; increases the cation exchange capacity of soil, resulting in less waste of applied nutrients; improves soil structure which enables better aeration of soil and increases soil water holding capacity.   | Tradecorp   | Spain    |
| KHUMIC-100                        | 70    | 5–10  | powder/flakes | Improves the structure of soil; increase the buffering power of soil; optimizes nutrients absorption by plants; neutralizes both acidic and alkaline soils, regulates the pH-value of soils, with the prominent effect in alkaline and acidic soil; reduces the toxins such as the ally aluminium and heavy metals; reduces high osmotic pressure within the root area; stimulates plant growth, increase the yield and quality; stimulates the membrane of seeds as well as the metabolic activities and thereby increase the germination rate; increases the capacity of root to take up nutrients; enhances cell assimilation; increases photosynthesis; reduces nitrate leaking into the groundwater and protect the underground water; increases the effectiveness of herbicide, pesticide and fungicide; immobilizes or reduce their harmful residues; stabilizes nitrogen and improve nitrogen efficiency (ideal as an additive with urea); complexes phosphate to reduce lock-ups. | KHumic      | China    |
| LIQHUMUS® Liquid 18               | 14    | 4     | liquid        | Immediately improves plant nutrient absorption and fertilizer efficiency of soils; increases the stress tolerance of plants against drought, salt, cold and heat; stimulates vigorous root growth and yield formation; increases the buffering and cation exchange capacity of soils; acts as a natural chelator for micronutrients in soils and increases their availability to plants; stimulates the formation of fertile, microbially active soils; improves the soil structure and increases its water holding capacity; increases the germination of seeds and enhances development of free radicle.   | Humin Tech  | Germany  |
| Prism Aqua Humic—Pure Crystal     | 60–65 | 15–20 | powder        | Extends the life of nano aquariums in particular; reduces stressful situations caused by high stocking density, transport, or high water temperatures; facilitates acclimatization; neutralizes organic poisons, unpleasant odours and the influence of foreign hormones; natural tannins and humic acids promote well-being and resistance; contains effective ingredients for preventing infectious diseases.  | Prism       | Germany  |
| ROKOHUMIN Klasik                  | 13    | -     | liquid        | Increases the quality and intensity of plant respiration by better opening the stomata in the leaves; supports the immune system of plants; increases resistance to stress (weather, drought, temperature, excess light...); helps improve photosynthesis; has a beneficial effect on the development of the root system; preserves and saturates the natural taste of fruits and vegetables; restores and preserves the natural fertility of the soil; ecologically friendly and safe for animals and bees.   | Humac®      | Slovakia |
| Sodium Humate                     | 70    | -     | powder        | Removes toxic metals and their ions from wastewaters; an adjunct in dissolved air flotation cells to assist in the removal of trace amounts of grease, oil, liquid organics and suspended matter; a coagulant aid to be used in conjunction with water-soluble polymeric flocculants for removal of soluble organics; fluid loss additives in certain types of organic liquids to prevent seepage from lagoons or pit containment areas.   | Mark Nature | China    |
| Turbo Root                        | 5.8   | 1.5   | liquid        | Roots: Humic and Amino Acid mix increases the number, and weight, of fine white roots and improves nutrient and water uptake by crops; increases the absorption of nutrients especially Phosphorus, Potassium and Zinc; increases the resistance of crops to stress from rapid growth and adverse climate; soil/potting substrate improves the structure and aggregation of soil encouraging root growth; increases the cation exchange capacity of soil which increases nutrient holding capacity; increase the population of beneficial microbes in the soil, promoting healthy soil.  | Tradecorp   | Spain    |

A photograph of two elegant, tulip-shaped glasses filled with a dark, rich liquid, likely a craft beer or stout, resting on a rustic wooden plank. In the foreground, a small mound of dark, moist soil is surrounded by several fresh sage leaves, suggesting a natural or organic theme. The background is a soft, out-of-focus green field, creating a serene and natural atmosphere.

**THANK YOU!**

**GRAZIE!**