



Ligno Power fertilizers.

Product catalog.



Innovative line of foliar fertilizers based on lignosulfonate.
Guaranteed efficiency and safety for the environment.



SCIENCE FOR AGRICULTURE

We are the producer of agricultural aids. Our activities are guided by the motto „Science for agriculture” - thanks to our knowledge and cooperation with scientists from Poland and abroad, we provide our clients with innovative products supported by many years of scientific research. Our experience in the field of optimization of plant protection treatments allows us to create products expected by farmers in the era of integrated pest management and the implementation of the assumptions of the European Green Deal. The ability to provide our clients with individual solutions and flexibility in cooperation are our priorities, which have allowed us to successfully support the agricultural industry for years.



Why is fertilization important?

The natural nutrient content of soils varies and changes with agricultural use. In many cases, soils are unable to meet the nutritional needs of plants. Many nutrients occur in soil in unavailable forms, and nutrients supplied with soil fertilizers may not be available to plants, e.g. in the case of improper soil pH. Foliar fertilization is an effective method of feeding plants with nutrients that have not been supplied from the soil. Studies show that plants make ten to thirty times better use of micronutrients when they are applied foliarly.

Thanks to foliar fertilizers, it is possible to eliminate mineral deficiencies as well as effectively prevent them.

Proper plant nutrition is a guarantee of good yields and plant health. To obtain maximum yields, it is necessary to provide plants with optimal nutrition with both macronutrients and micronutrients.

Seed development

Manganese (Mn) is involved in lipid synthesis, increasing the oil content of seeds.

MN

Green leaves and healthy inflorescences

Magnesium (Mg) is a key element of chlorophyll

Manganese (Mn) plays a key role in photosynthesis

Molybdenum (Mo) maintains the leaf surface in optimal condition

MG

MN

MO

Healthy Flowers

Zinc (Zn) affects seed germination and ripening

Calcium (Ca) is essential for pollen germination and pollen tube growth

Manganese (Mn) affects better flowering

ZN

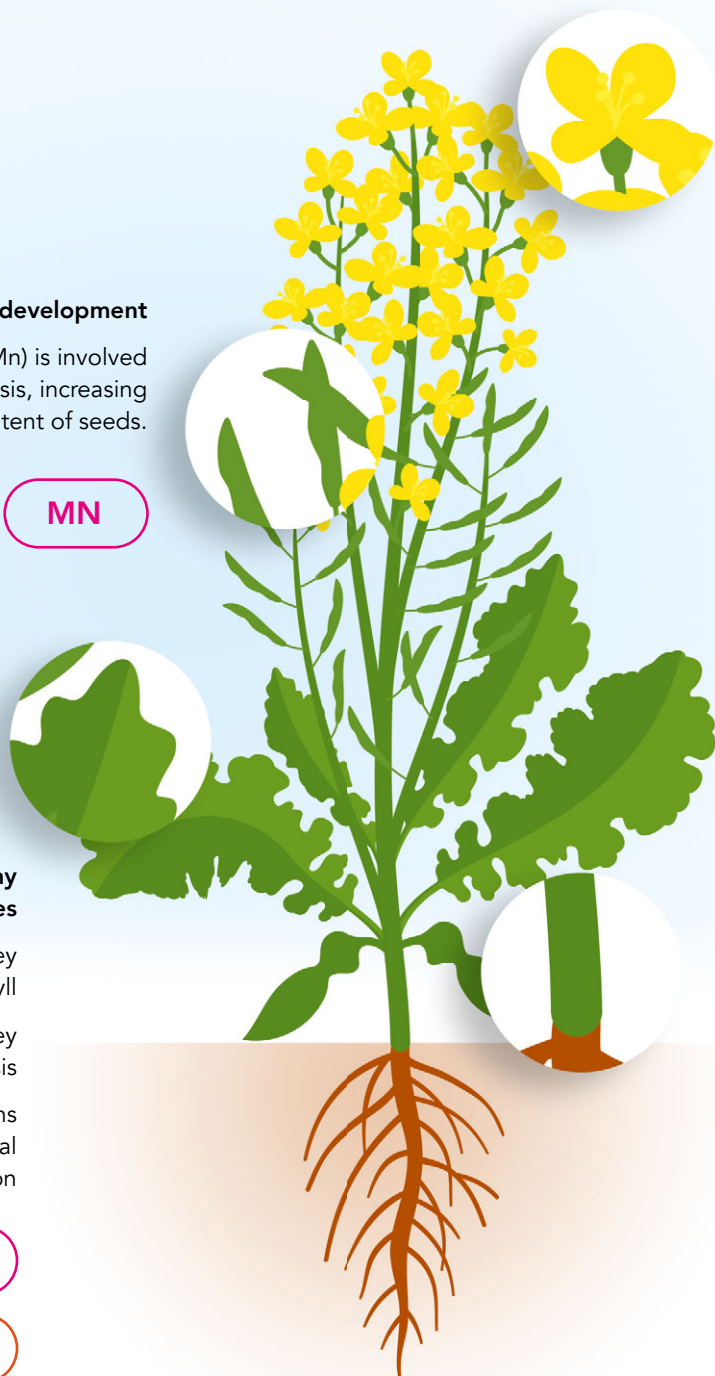
CA

MN

Good plant tissue structure

Calcium (Ca) plays an important role in building the structure of a plant, including its walls.

CA



LignoPower

Discover the innovative line of fertilizers based on a complexing agent– lignosulfonate. It is a guarantee of efficiency and safety for the environment



Innovative complexing agent

Lignosulfonate is a hygroscopic biopolymer based on lignin with natural properties of low surface tension, which ensures good distribution of microelements on the leaf surface. It helps to maintain nutrients in a water-soluble form, so they can diffuse and penetrate the leaves, even in low humidity conditions. Lignosulfonate protects metal salts of microelements from precipitation in unfavourable pH conditions of both soil and water, by activating several different binding sites with chemical affinity for metal salts such as iron, copper, manganese and zinc.

**Groundbreaking product!
Innovative formula!**

Advantages of the LignoPower fertilizer line:



ABSORBABILITY

Thanks to the use of an innovative formulation with lignosulfonate (a natural polymer), plants perfectly absorb the microelements contained in LignoPower fertilizers. Their absorption is gradual and guarantees a long-lasting effect.



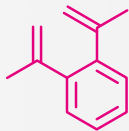
BIODEGRADABILITY

All components of LignoPower fertilizers are completely biodegradable and do not accumulate in the soil. They are 100% environmentally friendly.



COMPATIBILITY

LignoPower fertilizers can be successfully used in tank mixtures, with all traditional Plant Protection Products and other fertilizers.



STABILITY

Complexes formed by lignosulfonates are characterized by high resistance to decomposition, regardless of pH. Their durability is confirmed by their wide application in various industries.



SOLUBILITY

LignoPower fertilizers dissolve very well in water. The solutions are clear, free from precipitation or sediment. They do not clog sprayer filters.



QUALITY

Our experience on the market guarantees the stable composition of fertilizers and the high quality of the components used in them. We have selected the proportions of microelements in fertilizers in such a way as to maximize plant nutrition while ensuring good fertilizer mixability.

What is lignosulfonate?

Lignosulfonate is a substance derived mainly from lignin, which is a component of plant cell walls - it is a natural polymer found in plants. In the process of producing lignosulfonate, lignin is subjected to acid hydrolysis in the presence of sulfides. The resulting substance is purified to obtain the final product - lignosulfonate. Lignosulfonates consist of sulfonate groups attached to a hydrocarbon residue, which is part of the lignin structure.

It is an excellent complexing agent.



This means that the lignosulfonate repeat unit contains sulfonate groups (-SO₃Na) attached to a hydrocarbon residue (-CH₂-), which in turn occur in lignin molecules. Sulfonate units can combine to form long chain networks.

Thanks to this, lignosulfonates are characterized by excellent complexing properties, and products based on them provide excellent availability of the substances contained in them, e.g. microelements. Lignosulfonate is a substance used in many industries, including agriculture, to improve the properties of chemical substances.

What are the properties of lignosulfonate?

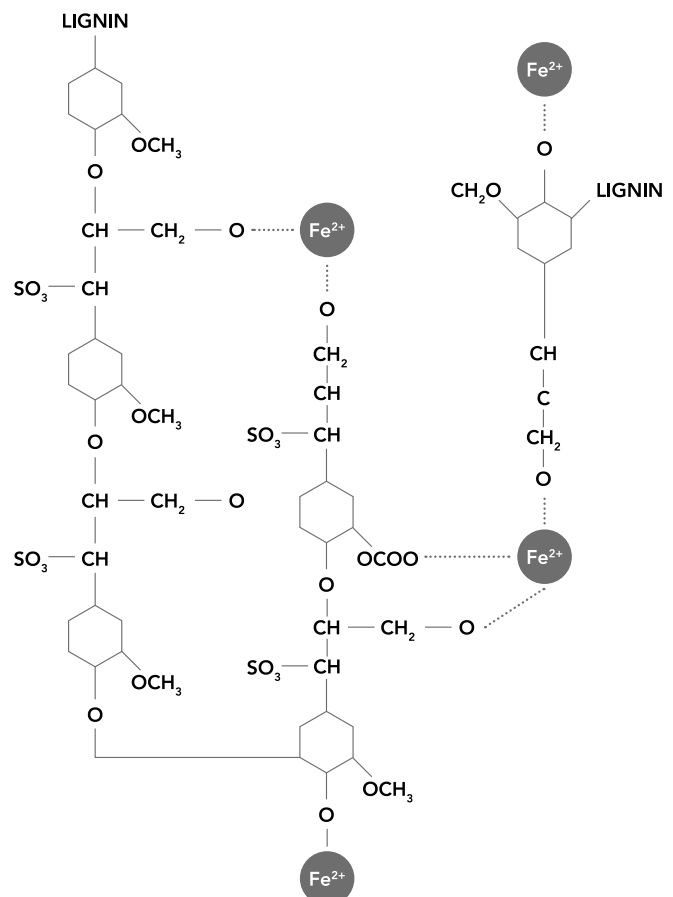
Lignosulfonate has properties that are key to ensuring proper uptake of microelements by plants.

It forms very stable complexes with metals. It protects metal salts of microelements from precipitation in unfavourable pH conditions, both in soil and water, by activating several different binding sites with chemical affinity for metal salts, such as iron, copper, manganese and zinc.

The complexing capacity of lignosulfonates depends on their carboxyl groups (-COOH), and especially on the hydroxyl groups attached to the phenolic ring (-OH). The hydroxyl groups of the phenolic ring (-OH) provide greater stability of complexation, especially at alkaline pH.

Lignosulfonate complexes are characterized by:

- durability regardless of pH conditions
- high resistance to decomposition
- ability to improve metal solubility
- ability to reduce heavy metal toxicity (they can be used in the adsorption of metals from aqueous solutions or soil, which has a positive effect on the quality of the natural environment)

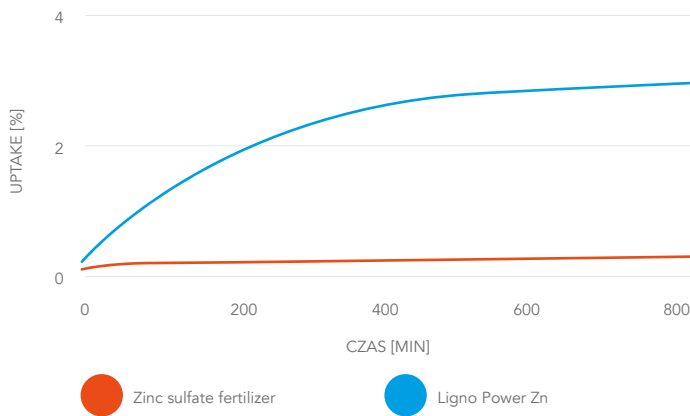


Improves the properties of liquids

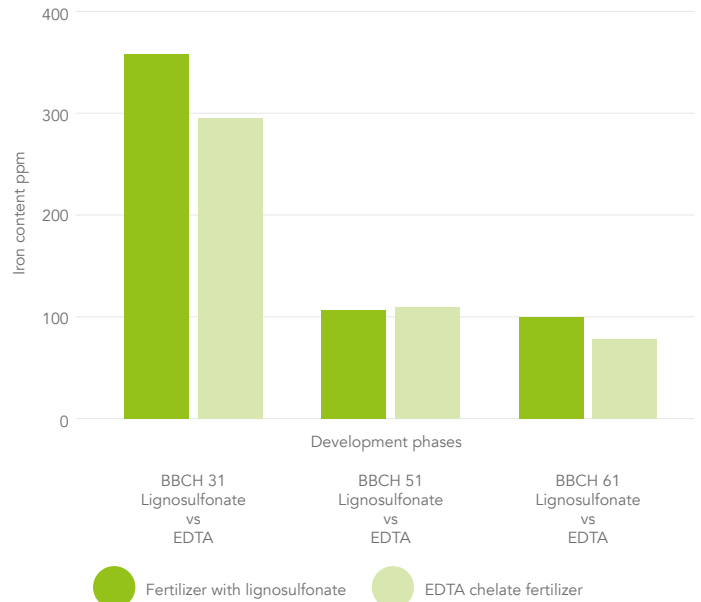
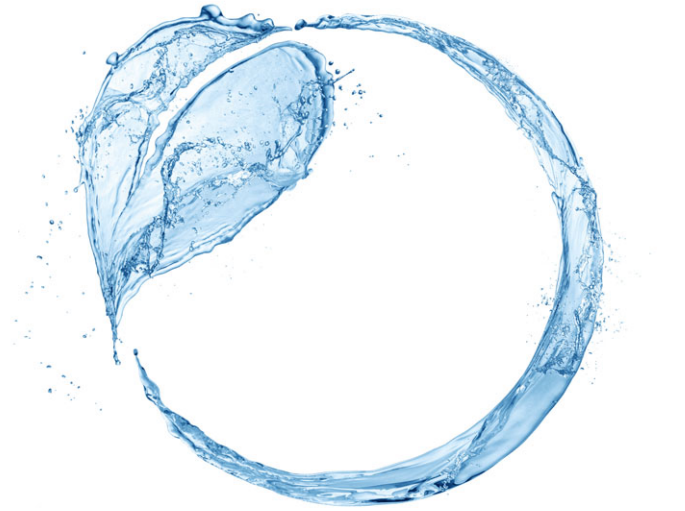
Lignosulfonate is a biopolymer with natural properties of low surface tension, which ensures good distribution of microelements on the surface of leaves. It reduces the attractive forces between liquid molecules, which facilitates its flow.

It is an effective emulsifying agent

Lignosulfonate can bind together substances that are incompatible with water or are difficult to dissolve in it. In foliar nutrition, it is essential to maintain nutrients in a water-soluble form to ensure diffusion, leaf penetration, and to prevent crystallization or precipitation, which can lead to leaf scorching. Lignosulfonate is a hygroscopic biopolymer. It helps to maintain nutrients in a water-soluble form, so they can diffuse and penetrate the leaves, even in low humidity conditions.



Deposits remaining on plants after zinc sulphate spraying (orange line) remain dry in a low humidity environment (33% relative humidity), while Ligno Power Zn deposits (blue line) are able to capture moisture from the air and remain moist and active for uptake by the leaves.



Iron content in wheat leaves depending on the form of fertilizer with lignosulfonate vs. EDTA chelate.

Completely biodegradable

Lignosulfonate is easily decomposed by organisms such as fungi and bacteria, because it is a naturally occurring organic compound produced from lignin, a natural plant polymer. The biodegradation process causes the breakdown of organic substances into simpler, inorganic chemical compounds that can be reused by living organisms or integrated into the ecosystem without harming the environment.

The use of lignosulfonate reduces the formation of residues in the soil and contributes to a reduction in the negative impact on the environment. Products based on lignosulfonate are more ecological than products containing chemical compounds that are not biodegradable.

Comparison of the properties of EDTA* chelated fertilizers and fertilizers based on lignosulfonates.

| | EDTA | LIGNOSULFONATES |
|------------------------------|--|---|
| ORIGIN | Synthetic chemical compound | Natural wood polymers |
| BIODEGRADABILITY | Not biodegradable, creates permanent residues in the soil | Completely biodegradable, doesn't create toxic pollutants. Provides organic matter in the soil. |
| TOXICITY | May be toxic to humans and the environment | Lack of toxicity to humans and the environment |
| COSTS | Chemical product, which means lower availability and higher costs | A compound more readily available (product of the cellulose industry), which means lower costs |
| DURABILITY | Maintains an appropriate level of microelements for a short period after application | Gradually releases microelements, which ensures their appropriate level for a longer period |
| ADDITIONAL PROPERTIES | | Improves the parameters of the spray liquid and therefore increases the effectiveness of treatments |

*currently the most common fertilizers on the market, used with all microelements

Did you know that...

By replacing EDTA-based fertilizers with lignosulfonate-based fertilizers, CO₂ emissions can be reduced by up to 100%? If we replace EDTA-based fertilizers with lignosulfonate-based fertilizers on Polish cereal land, CO₂ emissions will be reduced to an extent equivalent to the emissions of 40,000 cars per year or 280,000 flights from London to New York and back.



Conclusions

Fertilizers based on lignosulfonates are a more sustainable alternative in plant nutrition compared to those used in mass use (e.g. with EDTA). They provide biodegradability while providing high absorption of nutrients by plants and compatibility with other preparations.



LignoPower

Zn10%



ZINC DEFICIENT CROPS

Zinc:

- It is a component of enzymes and is their activator.
- Plays an important role in the generative phase of plants, influencing seed germination and maturation.
- By participating in the metabolism of sugars and proteins, it has a positive effect on the starch and protein content in plants.
- Increases plant resistance to pathogenic factors.

Zinc uptake from the soil is adversely affected by pH, high phosphorus content and the content of organic matter, which can act as a natural chelate. As pH increases, slightly soluble forms of zinc precipitate.

Foliar application of LignoPower Zn supplies plants with zinc in forms that are fully absorbed and used by plants. The use of zinc combined with liginosulfonate effectively replenishes deficiencies and counteracts their occurrence.



Benefits of using LignoPower Zn:

- Prevents zinc deficiency symptoms in the plant
- Increases the use of available nitrogen
- Demonstrates high absorption efficiency
- Responsible for the synthesis of proteins necessary for growth and building biomass
- Increases plant tolerance to low temperatures and frosts



Dosage: 1l/ha

Ingredients: Zinc (Zn) 10%

LignoPower

Mn7%



MANGANESE DEFICIENT CROPS

Manganese:

- It is an activator of many enzymes that perform important functions in the plant
- It participates in the photosynthesis process and chlorophyll synthesis.
- It plays an important role in cereal cultivation, influencing better flowering and tillering of plants.

The availability of manganese from the soil depends on pH, growing in acidic soils. High content of magnesium, iron and zinc in the soil causes disturbances in uptake and transport, due to ion antagonism. Limited access of manganese from the soil may also occur after liming and in the case of high content of organic matter in the soil.

LignoPower Mn allows plants to be provided with optimal nutrition with manganese in forms easily accessible to plants. Appropriate manganese nutrition significantly affects cereal yield indicators, improving grain quality parameters.



Benefits of using LignoPower Mn:

- Strengthens winter hardiness of crops
- Increases resistance to physiological diseases
- Takes part in the production of amino acids
- Improves the efficiency of photosynthesis and chlorophyll productionchlorofilu



Dosage: 1l/ha

Ingredients: Manganese (Mn) 7%

LignoPower

Fe5%



IRON DEFICIENT LEAF



Iron:

- An important component of chloroplasts and enzymes.
- Participates in the plant in photosynthesis processes, stimulating the formation of chloroplasts.
- Participates in respiration, reduction of nitrates and sulphates and in nitrogen assimilation.
- Iron deficiencies will affect the photosynthesis process, and thus directly limit the growth and development of plants.

The iron content in the soil depends primarily on pH, which affects the formation of sparingly soluble iron hydroxides. The uptake of the element is also hindered by excess phosphorus, causing iron precipitation in the soil and in the roots.

Benefits of using LignoPower Fe:

- Improves the efficiency of photosynthesis and chlorophyll production
- Takes part in the metabolism of nitrates
- Improves plant resistance to stress factors
- Stimulates proper plant growth and development



Dosage: 1l/ha

Ingredients: Iron (Fe) 5%

LignoPower

Cu5%



COPPER DEFICIENT WHEAT



Copper:

- Essential for proper plant growth.
- Participates in the photosynthesis process.
- Affects the activity of nitrate reductase (N).
- Affects the biosynthesis of amino acids.
- When plants are deficient in copper, starch synthesis is impaired.
- Participates in the lignification of the cell wall.
- Plays a role in pollen production, affects its viability.
- Is part of the enzyme that removes reactive oxygen species produced under stress conditions.

Copper, as a component of enzymes and proteins, performs a number of key metabolic functions in the plant. It is essential for the proper course of photosynthesis, being a building block of the chlorophyll molecule, respiration, and the metabolism of nitrogen compounds. In addition, copper also takes part in the lignification process, strengthening cell walls, and thus reducing the susceptibility of plants to lodging. In conditions of copper deficiency, chlorosis appears on plant leaves.

Benefits of using LignoPower Cu:

- Prevents copper deficiencies in the plant.
- Increases the use of available nitrogen.
- Copper nutrition stimulates plant immunity.
- Optimal copper nutrition of plants increases yields and has a positive effect on their quality.



Dosage: 1l/ha
Ingredients: Copper (Cu) 5%

LignoPower

MIKRO
Cu, Fe, Mn, Mo, N, Zn



CROPS WITH MICROELEMENT DEFICIT

LignoPower Mikro foliar fertilizer contains a composition of microelements necessary for the proper growth and development of plants. Microelements contained in LignoPower Mikro are in forms that are easily accessible to plants, thanks to which they quickly and effectively nourish plants and supplement any deficiencies.

- Dosage: 1l/ha**
- Ingredients:**
- Manganese (Mn) 3%**
- Zinc (Zn) 2.2%**
- Iron (Fe) 1%**
- Copper (Cu) 0.25%**
- Molybdenum (Mo) 0.15%**
- Nitrogen (N) 2%**



Benefits of using LignoPower Mikro:

- Contains key microelements responsible for the proper development and growth of crops
- Increases the use of available nitrogen
- Fertilizer completely soluble in water
- Lowers the surface tension of droplets, prevents washing away of fertilizer from the plant surface

LignoPower



Ligno Power Mikro microelement fertilizer is fully compatible with other chemical agents. The appropriate pH guarantees solution stability. The properties of lignosulfonate, reducing surface tension, cause even coverage of the plant surface, without the need for additional surfactants. In addition, the biopolymer has low-foaming properties, facilitating the creation of complex tank mixtures.

Ligno Power MIKRO covers the microelement needs of plants and increases the effectiveness of appropriate pesticides.



| CULTIVATION | APPLICATION QUANTITY | APPLICATION DATE | DOSE / HA | RECOMMENDED WATER QUANTITY |
|-------------------|----------------------|--|--------------|----------------------------|
| Cereals | 3 | AUTUMN: from 3 leaf stage to winter dormancy | 1l/ha | 180- 300l |
| | | SPRING: - tillering phase - beginning of shoot formation - flag leaf phase | | |
| Rapeseed | 3 | AUTUMN: from 4-5 leaf stage to winter dormancy | 1,0- 1,5l/ha | 180-300l |
| | | SPRING: - from main shoot growth stage to green bud - compact green flower bud stage | | |
| Maize | 2 | Phase 3-6 leaf | 1 l/ha | 180-300l |
| | | Phase 6-8 leaf | | |
| Sugar Beet | 2 | Phase 6-8 leaves | 1,5 l/ha | 180-300l |
| | | Compact inter-rows | | |
| Potatoes | 2 | Covering the inter-rows | 1l/ha | 180-300l |
| | | Flowering | | |
| Vegetables | 2-3 | Leaf growth and biomass building | 1l/ha | 200- 500l |
| Orchards | 3-4 | Fruit growth phase | 0,5l/ha | 300-800l |

LignoPower

Zn10%

LignoPower

Mn7%

LignoPower

Fe5%

LignoPower

Cu5%

LignoPower

MIKRO
Cu, Fe, Mn, Mo, N, Zn



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