TOPSOIL
Organomineral Soil Conditioner
有机矿物土壤调理剂

TOPSOIL OSC

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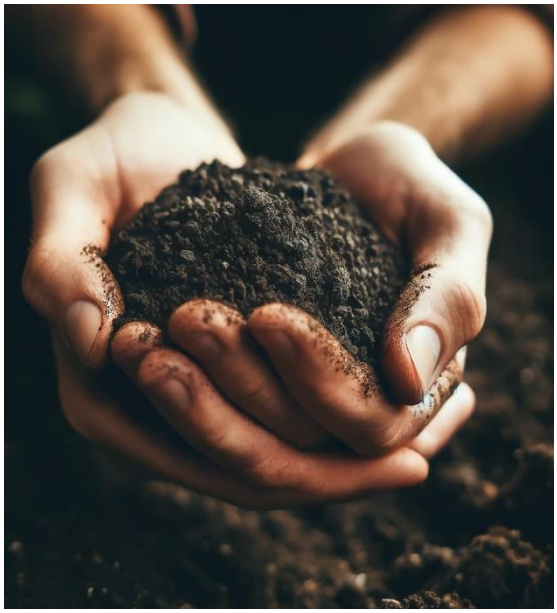

TOPSOIL Organomineral Soil Conditioner (TOSC) is an innovative class of engineered ingredients specifically designed to improve soil health. It incorporates nanomaterials, organic matter, and plant-based minerals to deliver a range of substantial benefits. TOSC enhances both soil health and plant growth by integrating the best aspects of organic matter and plant-based minerals with the precision of nanotechnology. This combination offers a transformative approach to agricultural practices, providing multifaceted advantages for more efficient and sustainable farming.

TOPSOIL Organomineral Soil Conditioner (TOSC) 是一种创新的原料成分,专为改良土壤使其健康而设计。它结合了纳米材料、有机物质和植物基矿物,以带来一系列改良土壤的重大好处。TOSC通过将有机物质和植物基矿物与纳米材料的精准结合,改良了土壤使其变得健康和增强了植物生长速度。这种结合为农业实践提供了一种变革性的方法,为更高效和可持续的农业发展提供了多方面的优势。

For Soil 用于土壤

- **Increased Cation Exchange Capacity:** TOSC significantly enhances the CEC of soils, which are vital storehouses of plant nutrients. CEC refers to the total negative charge a soil can hold, thus determining its capacity to retain cations. A higher CEC enables soils to hold and exchange more cations with plant roots, providing essential nutrition for optimal growth.

  提高阳离子交换容量：TOSC 显著增强了土壤的阳离子交换容量（CEC），这对于植物养分的储存至关重要。CEC 指的是土壤能够保持的总负电荷量，因此决定了其保留阳离子的能力。较高的 CEC 使土壤能够与植物根部保持和交换更多的阳离子，为植物的最佳生长提供必要的营养。

- **Improved Soil Structure:** TOSC is particularly effective in amending soils that are too compact or have poor texture, such as hardpan or clay soils. It loosens soil textures, unlocks nutrients, and improves the overall soil structure. This makes it suitable for soils that are otherwise unsupportive of plant growth or have been neglected for long

periods. The organic and mineral components within TOSC enhance soil aggregation and porosity, which facilitates better root penetration, air circulation, and water infiltration, creating a healthier environment for plants.

改善土壤结构：TOSC 在改良过于压实或质地较差的土壤方面特别有效,例如板结土或黏土。它能够疏松土壤质地,释放养分,并改善整体土壤结构。这使得它适合于不支持植物生长或长时间被忽视的土壤。TOSC 中的有机和矿物成分增强了土壤的聚集性和孔隙率,有助于更好的根系渗透、空气循环和水分渗透,为植物创造了一个更健康的生长环境。

- **Enhanced Nutrient Availability:** The inclusion of nanomaterials in TOSC enables a more efficient delivery and uptake of nutrients. Nanoparticles provide controlled nutrient release, ensuring a consistent supply over time, which reduces waste and decreases the frequency of applications.

  增强营养物质的可用性：在 TOSC 中加入纳米原料可以更有效地输送和吸收营养物质。纳米颗粒提供控制性的营养释放,确保随着时间的推移持续供应,从而减少了浪费并降低了施用频率。

- **Increased Water Retention:** The organic matter in TOSC can absorb and retain significantly more water than untreated soil. This attribute is crucial for maintaining moisture levels, especially in arid areas or during dry spells, and helps reduce the reliance on irrigation.

  增加水分保持能力：TOSC **中的有机物比未**处理的土壤能吸收和保持更多的水分。这**一特性**对于保持水分水平至关重要,**特**别是在干旱地区或干旱期间,**有助于减少**对灌溉的依赖。

- **Promotion of Beneficial Microbial Activity:** The combination of organic matter and specific minerals fosters a diverse and robust microbial ecosystem in the soil. These microbes are critical for nutrient cycling, decomposing organic matter, and suppressing soil-borne diseases.

  促进有益微生物活动：有机物质和特定矿物的结合在土壤中培养了一个多样化且强壮的微生物生态系统。这些微生物对于营养循环、分解有机物质和抑制土传疾病至关重要。

- **pH Balancing:** Plant-based minerals in TOSC help to buffer soil pH to more favourable levels for plant growth, benefiting soils that are excessively acidic or alkaline.

  pH平衡：TOSC中的植物基矿物有助于将土壤pH缓冲至更有利于植物生长的水平,对于过酸或过碱的土壤尤其有益。

- **Enhanced Resistance to Erosion and Compaction:** Improved soil structure and moisture retention contribute to preventing soil erosion and reducing compaction, which are crucial for maintaining agricultural productivity and environmental quality.

  增强抗侵蚀性和压实性: 改善的土壤结构和保湿性有助于防止土壤侵蚀和减少压实,这对于维持农业生产力和环境质量至关重要。

For Plants 用于植物

- **Improved Nutrient Uptake:** TOSC enhances the bioavailability of nutrients, enabling plant roots to absorb them more easily and efficiently. This leads to healthier, more vigorous growth and increased yields.

  改善养分吸收: TOSC提高了养分的生物利用率,使植物根系更容易有效地吸收养分, 这将带来植物更健康、更旺盛的生长,并提高产量。

- **Balanced Nutrient Supply:** The product is expertly formulated to contain specific proportions of primary macronutrients (Nitrogen, Phosphorus, and Potassium), secondary macronutrients (Calcium, Magnesium, and Sulfur), and micronutrients (Boron, Iron, Manganese, Molybdenum, Copper, and Zinc) that are essential for optimal plant growth.

  均衡的营养供应: 该产品经过专业配方,含有特定比例的主要常量营养素(氮、磷、钾) 、次要常量营养素(钙、镁、硫)以及微量营养素(硼、铁、锰、钼、铜、锌), 这些营养素对植物的最佳生长至关重要。

- **Enhanced Growth and Yield:** With improved nutrient availability, water retention, and overall soil conditions, plants can thrive and produce higher yields. This benefit extends to food crops, ornamental plants, and lawns alike.

  提高生长和产量: 通过改善营养供应、保水性和整体土壤条件,植物能够茁壮成长并产出更高的产量。这种益处适用于粮食作物、观赏植物和草坪。

- **Immediate and Slow-Release Nutrients:** TOSC offers both immediate and slow-release forms of nutrients. Minerals quickly address deficiencies, while organic components decompose gradually, ensuring a steady nutrient supply throughout the growth phases of plants.

  即时和缓释养分: TOSC 提供即时和缓释养分的两种形式。矿物质迅速解决缺乏的养分问题,而有机成分逐渐分解,确保植物生长各阶段都有稳定的养分供应。

- **Reduced Risk of Nutrient Leaching:** The balanced and slow-release nature of nutrients in TOSC minimizes nutrient leaching, which is better for the environment and helps prevent groundwater contamination.

降低养分浸出风险: TOSC 中养分平衡和缓释特性最大限度的减少了养分浸出,这对环境更有益,有助于防止地下水污染。

- **Increased Stress Resistance:** Plants grown in soil treated with TOPSOIL OSC often exhibit enhanced resilience to stresses such as drought, salinity, and diseases, thanks to the improved soil environment and nutrient availability.

  增强抗压能力: 在经过TOSC处理的土壤中生长的植物通常表现出更强的抗压力,比如对干旱、盐碱和疾病等,这得益于改善的土壤环境和养分的可用性。

- **Efficiency in Application:** Due to its concentrated, nutrient-rich composition, TOSC requires a smaller physical volume per application compared to traditional compost. This makes it more efficient to transport and apply, particularly in large-scale agricultural operations.

  施用效率: 由于其浓缩、营养丰富的成分,与传统堆肥相比,TOSC 每次施用的物理体积较小,这使其在运输和应用效率更高,特别是在大规模农业操作中。

- **Reduced Chemical Need:** By providing a natural, slow-release source of nutrients and enhancing soil health, TOSC reduces the reliance on chemical fertilizers and pesticides. This not only lowers costs but also decreases the environmental footprint of farming practices.

  减少化学品需求: 通过提供天然、缓释的营养来源和增强土壤健康,TOSC 减少了对化学肥料和农药的依赖。这不仅降低了成本,而且还减少了农业实践对环境的影响。

- **Carbon Sequestration:** The rich organic matter in TOSC contributes to carbon storage in the soil, which helps mitigate climate change by reducing atmospheric carbon dioxide levels—a process known as carbon sequestration.

  碳固定：TOSC 中丰富的有机物质有助于土壤中的碳储存，这通过降低大气中的二氧化碳水平帮助缓解气候变化，这个过程被称为碳固定。

- **Long-term Soil Health**: Unlike synthetic fertilizers, which may degrade soil quality over time, TOSC contributes to the long-term improvement of soil health, ensuring sustainable agricultural productivity.

  长期土壤健康: 与可能随时间降低土壤质量的合成肥料不同(比如化肥), TOSC 有助于土壤健康的长期改善,确保农业生产的可持续性。

By addressing both immediate and long-term needs of the soil and plants, TOSC embodies a holistic approach to agricultural and horticultural management by enhancing plant growth and productivity, conserving water, reducing chemical use, and improving soil health, aligning with the principles of sustainable development.

通过解决土壤和植物的即时和长期需求，TOSC 体现了一种全面的农业和园艺管理方法，通过增强植物生长和生产力、节约水资源、减少化学品使用和改善土壤健康，符合可持续发展的原则。

The Importance of Cation Exchange Capacity (CEC) in Soil

土壤中阳离子交换容量（CEC）的重要性

Understanding Cation Exchange and Cation Exchange Capacity

了解阳离子交换和阳离子交换容量

Soil consists of clay minerals and organic matter, which are predominantly negatively charged. This charge attracts positively charged ions, known as cations, through electrostatic forces, allowing them to adhere to the soil's surface within the root zone. This process is essential because it prevents cations from being easily washed away by leaching. The term "cation exchange" refers to the ability of these adsorbed cations to swap places with other cations present in the soil solution. As plants absorb nutrients and deplete cations in the soil solution, the adsorbed cations replenish them, ensuring a continuous supply of nutrients to the plant roots.

土壤由粘土矿物和有机物组成,它们主要带负电。这种电荷通过静电力吸引带正电的离子,即阳离子,使它们附着在根区的土壤表面。这个过程是至关重要的,因为它可以防止阳离子容易被水分浸出冲走。术语“阳离子交换”是指这些吸附的阳离子与土壤溶液中存在的其他阳离子交换位置的能力。当植物吸收养分并耗尽土壤溶液中的阳离子时,吸附的阳离子会补充养分,确保养分持续供应给植物根系。

Cation Exchange Capacity (CEC) quantifies the total negative charges in the soil that can adsorb nutrient cations such as calcium (Ca^{2+}), magnesium (Mg^{2+}), and potassium (K^{+}). CEC is a critical soil property as it indicates the soil's ability to hold and supply nutrient cations to plants. For example, when fertilizer is added, it temporarily increases the nutrient concentration in the soil solution, promoting movement of nutrients towards the clay particles where they can be exchanged and made available for plant uptake.

阳离子交换容量(CEC)量化了土壤中能吸附营养阳离子如钙(Ca^{2+})、镁(Mg^{2+})和钾(K^{+})的总负电荷。CEC是一种关键的土壤属性,因为它表明了土壤保持和供应植物营养阳离子的能力。例如,当添加肥料时,它会暂时增加土壤溶液中的营养浓度,促进营养物质向黏土颗粒移动,在粘土颗粒中进行交换并可供植物吸收。

Nutrient cations used by plants in significant amounts include potassium, calcium, and magnesium. Other cations like ammonium (NH_4^{+}), sodium (Na^{+}), hydrogen (H^{+}), aluminum (Al^{3+}), iron (Fe^{2+} or Fe^{3+}), manganese (Mn^{2+}), copper (Cu^{2+}), and zinc (Zn^{2+}) are also adsorbed at these exchange sites. Micronutrients such as zinc, copper, iron, and manganese are usually

present in very low concentrations in soil. Ammonium levels are typically low as well because microorganisms convert ammonium to nitrate through a process called nitrification.

植物大量使用的营养阳离子包括钾、钙和镁。其他如铵（NH_4^+）、钠（Na^+）、氢（H^+）、铝（Al^{3+}）、铁（Fe^{2+}或Fe^{3+}）、锰（Mn^{2+}）、铜（Cu^{2+}）和锌（Zn^{2+}）等阳离子也会在这些交换位点被吸附。微量营养素如锌、铜、铁和锰在土壤中通常存在的浓度非常低。铵的水平通常也很低，因为微生物会通过一个称为硝化的过程将铵转化为硝酸盐。

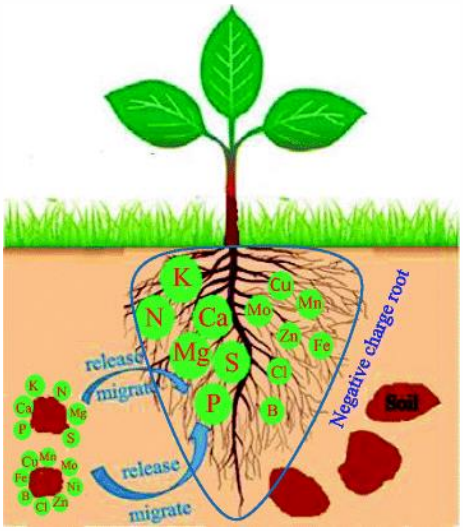

Figure 1. *Schematic diagram showing exchange of cations between the soil surfaces and the soil solution, and the movement of these cations from soil to roots (rhizosphere) for uptake.*

图1*。示意图显示了土壤表面与土壤溶液之间的阳离子交换，以及这些阳离子从土壤到根部（根际区）的移动以供吸收。*

Forms of Nutrient Elements in Soils

土壤中的营养元素形态

- **Ions in Soils 土壤中的离子**

  Elements that carry an electrical charge are known as ions. Those with a positive charge are referred to as cations, while those with a negative charge are called anions.

  带有电荷的元素被称为离子。带正电荷的称为阳离子，带负电荷的称为阴离子。

- **Common Soil Cations 常见的土壤阳离子**

  The typical cations found in soil include calcium (Ca^{2+}), magnesium (Mg^{2+}), potassium (K^+), ammonium (NH_4^+), hydrogen (H^+), and sodium (Na^+). It's important to note that some cations, like calcium and magnesium, carry more than one positive charge.

土壤中常见的阳离子包括钙（Ca^{2+}）、镁（Mg^{2+}）、钾（K^{+}）、铵（NH_4^{+}）、氢（H^{+}）和钠（Na^{+}）。值得注意的是，一些阳离子，如钙和镁，带有多于一个的正电荷。

- **Common Soil Anions 常见的土壤阴离子**

  Soil anions commonly include chloride (Cl^{-}), nitrate (NO_3^{-}), sulfate (SO_4^{2-}), and phosphate (PO_4^{3-}). These anions often possess more than one negative charge and are typically found as combinations with oxygen.

  土壤中常见的阴离子包括氯化物（Cl^{-}）、硝酸盐（NO_3^{-}）、硫酸盐（SO_4^{2-}）和磷酸盐（PO_4^{3-}）。这些阴离子通常带有多于一个的负电荷，并且通常以与氧结合的形式存在。

Typical CEC Values in Soils

土壤中典型的阳离子交换容量值

In most soil reports, CEC is expressed as milliequivalents (meq) of charge (number of charges) per 100 grams of soil (meq/100 g or as cmol/kg when using International Scientific Units). The number of milliequivalents is used rather than a weight (pounds, grams, etc.) of adsorbed cations because CEC represents the total number of charges, which is a better standard of comparison of different soils because each cation species has a different weight and soils differ in the proportions of the different cation species.

在大多数土壤报告中，阳离子交换容量（CEC）表示为每100克土壤的毫当量（meq）电荷（电荷数）（meq/100g），或者在使用国际科学单位时表示为cmol/kg。使用毫当量而不是吸附阳离子的重量（磅，克等），因为CEC代表的是总电荷数，这是比较不同土壤的更好标准，因为每种阳离子的重量不同，土壤中不同阳离子种类的比例也不同。

How CEC changes with Soil pH

土壤中的阳离子交换容量如何随pH值变化

The CEC of soil organic matter and some clay minerals varies with soil pH. Typically, CEC is at its lowest when soil pH ranges from 3.5 to 4.0 and increases when the pH is raised through the application of lime to acidic soils, as shown in Figure 2. Due to this variation, CEC measurements are commonly taken at a neutral pH of 7.0. It is also noteworthy that at low pH levels, certain soil mineral surfaces may develop positive charges that can retain anions (negatively charged ions) such as chloride (Cl^{-}) and sulfate (SO_4^{2-}).

土壤有机质和某些粘土矿物的阳离子交换容量（CEC）随土壤pH值的变化而变化。通常，当土壤pH值在3.5到4.0范围内时，CEC最低，并且当通过施用石灰提高酸性土壤的pH值时，CEC会增加，如图2所示。由于这种变化，CEC的测量通常在中性pH值7.0进行。还值得注意

的是，在低pH水平下，某些土壤矿物表面可能会发展出正电荷，这些正电荷可以保留阴离子（带负电荷的离子），如氯离子（Cl^-）和硫酸盐（SO_4^{2-}）。

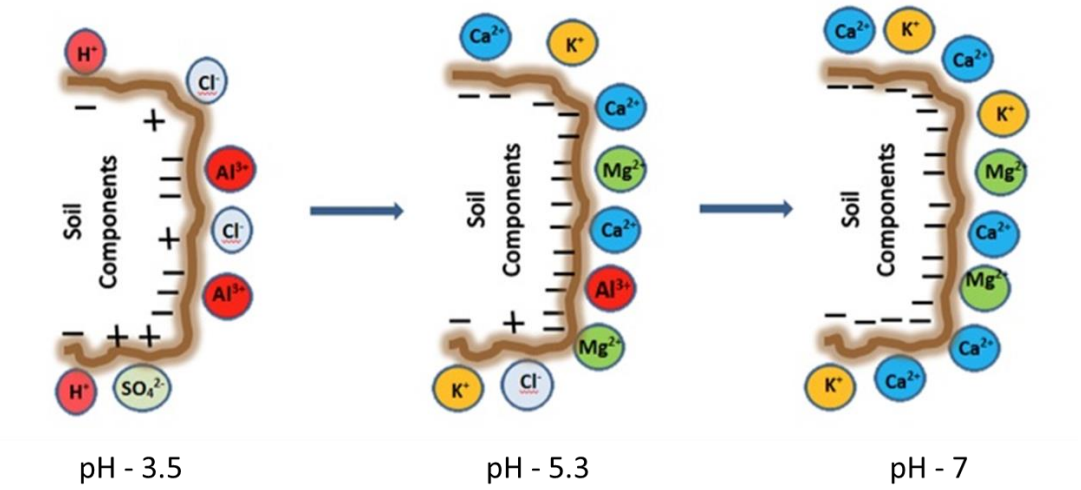

Figure 2. *Relationship between CEC and pH*

图2. CEC与pH值之间的关系

Relationship Between CEC and Fertilization Practices

阳离子交换容量与施肥实践之间的关系

Fertilization and liming recommendations vary significantly based on the Cation Exchange Capacity (CEC) of the soil. Soils with high CEC and buffer capacity exhibit slow pH changes under typical management practices compared to soils with low CEC. As a result, high-CEC soils require less frequent liming. However, when these soils do become acidic and require liming, larger amounts of lime are necessary to achieve the desired pH level.

CEC also affects the timing and frequency of nitrogen and potassium fertilizer applications. On soils with low CEC (less than 5 meq/20,000g), applying ammonium nitrogen and potassium may lead to nutrient leaching below the root zone, especially in sandy soils with low-CEC subsoils. Conversely, soils with high CEC (greater than 10 meq/100g) experience minimal cation leaching, making the application of nitrogen and potassium more effective.

根据土壤的阳离子交换容量(CEC),施肥和施石灰的建议差异很大。与CEC低的土壤相比,具有高CEC和缓冲能力的土壤在典型管理实践下表现出缓慢的pH变化。因此,CEC较高的土壤需要较少的石灰。然而,当这些土壤确实变酸性并需要施石灰时,需要大量的石灰才能达到所需的pH水平。

CEC还影响氮钾肥施用的时间和频率。在CEC较低(小于5meq/20,000g)的土壤上,施用铵态氮和钾可能导致根区以下的养分浸出,尤其是在CEC低的沙质土壤和底层土壤中。相反,具有高CEC(超过10meq/100g)的土壤几乎不发生阳离子淋失,使得氮和钾的施用更为有效 。

Cation Exchange and Its Role in Soil Fertility

阳离子交换及其在土壤肥力中的作用

- **Cation Exchange and Soil Fertility 阳离子交换与土壤肥力**

  Cation exchange is a crucial chemical property of soil, derived from the negative charges on clay and organic matter particles that attract positively charged elements, or cations. The total ability of the soil to retain these cations is measured by its CEC. This capacity influences the soil's ability to hold essential nutrients such as potassium, calcium, magnesium, and ammonium-nitrogen, and also reflects soil acidity levels influenced by cations like aluminum and hydrogen. Soils with coarse textures, such as sandy soils, typically exhibit low CEC due to their minimal clay and organic matter content. Conversely, soils rich in clay or organic matter tend to have high CEC.

  阳离子交换是土壤的一项关键化学性质，源于粘土和有机物颗粒上的负电荷，这些负电荷吸引正电荷元素，即阳离子。土壤保持这些阳离子的总能力通过其CEC（阳离子交换容量）来衡量。这种能力影响土壤保持诸如钾、钙、镁和铵态氮等重要营养素的能力，并且还反映了由铝和氢等阳离子影响的土壤酸度水平。质地粗糙的土壤，如沙质土壤，通常因为粘土和有机物含量少而显示出低CEC。相反，富含粘土或有机物的土壤往往具有高CEC。

- **CEC as an Indicator of Soil Texture and Fertility CEC作为土壤质地和肥力的指标**

  CEC not only provides insights into soil texture but is also a key indicator of general soil fertility. Additionally, base saturation, which represents the percentage of the CEC occupied by "basic" cations (as opposed to acidic cations), is a crucial factor in soil fertility. The basic cations commonly considered are calcium, magnesium, potassium, and sodium. Occasionally, the base saturation percentage of a nutrient can offer an approximation of that nutrient's supply relative to other basic cations. However, the role of base saturation in formulating crop fertilizer recommendations is often misunderstood and can be misapplied.

  CEC不仅提供了关于土壤质地的见解，而且还是总体土壤肥力的关键指标。此外，碱基饱和度，即CEC被“碱性”阳离子（与酸性阳离子相对）占据的百分比，是土壤肥力中的一个关键因素。常被考虑的碱性阳离子包括钙、镁、钾和钠。偶尔，某一营养素的碱基饱和度百分比可以提供该营养素相对于其他碱性阳离子的供应量的近似值。然而，碱基饱和度在制定作物施肥建议中的作用常常被误解，并可能被误用。

How TOSC Increases CEC

如何通过TOSC提高CEC

- **Organic Matter Addition:** Adding organic matter, such as compost, biochar, and humic substances to the soil is a key method for enhancing CEC. Organic matter contains negatively charged sites that attract and retain positively charged nutrient ions. As it decomposes, organic matter transforms into humus, which boasts a high CEC and significantly enhances the soil's overall nutrient-holding capacity.

  添加有机物质：向土壤中添加有机物质，如堆肥、生物炭和腐殖质，是增强CEC的关键方法。有机物质含有负电荷位点，能吸引并保留带正电的营养离子。随着其分解，有机物质转化为腐殖质，腐殖质具有高CEC，并显著增强土壤的整体营养保持能力。

- **Clay Mineral Enrichment:** TOSC includes clay minerals and plant-based minerals known for their natural ability to adsorb cations. By adding these minerals to the soil, they increase the total CEC, providing additional sites for cation exchange.

  粘土矿物增富：TOSC包括粘土矿物和以其天然吸附阳离子能力而闻名的植物基矿物。通过向土壤中添加这些矿物，它们增加了总CEC，提供了更多的阳离子交换位点。

- **pH Adjustment:** TOSC helps adjust soil pH to a more neutral range, which can indirectly boost CEC. Soil components such as clay and organic matter have more negatively charged sites available for cation exchange at neutral pH levels, thereby improving the soil's CEC.

  pH值调整：TOSC有助于将土壤pH值调整到更中性的范围，这可以间接提高CEC。在中性pH水平下，土壤成分如粘土和有机物具有更多可用于阳离子交换的负电荷位点，从而提高土壤的CEC。

- **Stimulation of Microbial Activity:** The organic elements of TOSC support the proliferation and activity of soil microorganisms. These microbes play a crucial role in converting organic matter into humic substances, which are highly effective at cation exchange, further elevating the soil's CEC.

  刺激微生物活动：TOSC的有机成分支持土壤微生物的增殖和活动。这些微生物在将有机物质转化为腐殖质方面发挥着至关重要的作用，腐殖质在阳离子交换中非常有效，进一步提高土壤的CEC。

Benefits of Increased CEC

增加CEC的好处

- **Enhanced Nutrient Retention:** Soils with a higher CEC can better retain nutrients, preventing them from being washed away by water. This ensures that nutrients remain available for plant uptake for extended periods.

  增强营养物质保留力: 具有较高CEC的土壤可以更好地保留营养物质,防止它们被水冲走。这确保了营养物质在较长时间内仍然可供植物吸收。

- **Improved Soil Structure:** Soils rich in organic matter and with a higher CEC tend to exhibit improved structure. This enhances water infiltration, root penetration, and aeration.

  改善土壤结构：富含有机物质并具有较高CEC的土壤往往表现出改善的结构。这有助于增强水的渗透、根系穿透和通气。

- **Increased Efficiency of Fertilizers:** A higher CEC allows for more efficient utilization of applied fertilizers by the soil and plants, reducing the need for frequent applications and diminishing the risk of environmental pollution.

  肥料利用效率提高：较高的CEC可以使土壤和植物更有效地利用施加的肥料，减少频繁施用的需求，降低环境污染的风险。

- **Greater Resilience to pH Changes:** Soils with a higher CEC are more buffered against pH fluctuations, aiding in maintaining soil health and nutrient availability even under varied environmental conditions.

  对pH变化的更强韧性：具有较高CEC的土壤对pH波动具有更强的缓冲能力，有助于在各种环境条件下保持土壤健康和营养素可用性。

General Differences between TOPSOIL Organomineral Soil Conditioner, Compost, and Fertilizers

TOPSOIL有机矿质土壤调理剂、堆肥和肥料之间的一般区别

Each of these products serves distinct roles in gardening and agriculture, enhancing soil health and plant growth in various ways. Here's a detailed breakdown of their differences:

这些产品在园艺和农业中发挥着不同的作用，以多种方式增强土壤健康和植物生长。以下是它们的区别的详细分析：

- **TOPSOIL Organomineral Soil Conditioner**
  TOPSOIL有机矿物土壤调理剂

  Composition: This soil conditioner is a blend of organic matter and mineral nutrients, designed to improve soil structure and nourish plants. The organic component typically originates from plant or animal waste, while the mineral component consists of primary macronutrients, secondary macronutrients, and micronutrients.

  成分: 这种土壤调理剂是有机物质和矿物营养物质的混合物,旨在改善土壤结构并滋养植物。有机成分通常来自植物或动物废弃物,而矿物成分包括主要的常量营养素、次要的常量营养素和微量营养素。

  Purpose: The primary objective is to enhance soil structure, increase water retention, improve cation exchange capacity, support microbial life, provide a rich nutrient source, and ensure a slow nutrient release that is accessible to plant roots.

  目的：主要目标是增强土壤结构，提高水分保持能力，改善阳离子交换能力，支持微生物生活，提供丰富的营养源，并确保植物根系能够缓慢释放的营养物质。

  Usage: These conditioners are especially beneficial in soils that are degraded or have poor structure. They can aid sandy soils by increasing water holding capacity and improve clay soils by enhancing aeration and reducing compaction.

  用法：这些调理剂在土壤退化或结构较差的情况下特别有益。它们可以通过增加水持有能力来帮助沙质土壤，并通过增强通气性和减少压实来改善粘土土壤。

- **Compost**
  堆肥

  Composition: Compost consists of decomposed organic matter, typically sourced from kitchen scraps, yard waste, and other organic materials. It is nutrient-rich and hosts beneficial microorganisms.

  成分：堆肥由分解的有机物质组成，通常来自厨房残渣、庭院垃圾和其他有机材料。它富含营养，寄生着有益的微生物。

  Purpose: The primary use of compost is to enrich the soil, offering a wide range of nutrients and improving soil structure. It enhances moisture retention, supports microbial life that aids plant growth, and naturally helps reduce pests and diseases.

  目的：堆肥的主要用途是丰富土壤，提供多种营养，并改善土壤结构。它增强了土壤的保水能力，支持有益于植物生长的微生物生活，并自然地有助于减少害虫和疾病。

Usage: Compost is versatile and can be incorporated into garden beds, used as mulch, or mixed with potting soils. It serves as a comprehensive soil amendment to boost soil fertility and health.

用法：堆肥用途广泛，可以添加到花园土壤中、用作覆盖物或与盆栽土混合使用。它作为全面的土壤改良剂，可以提高土壤的肥力和健康。

Fertilizer

肥料

Composition: Fertilizers, which can be organic or inorganic, provide specific nutrients (such as nitrogen, phosphorus, and potassium) essential for plant growth. Inorganic fertilizers are chemically synthesized, whereas organic fertilizers are derived from natural sources like manure, bone meal, or composted plant matter.

成分：肥料可以是有机的或无机的，提供植物生长所必需的特定营养素（如氮、磷和钾）。无机肥料是化学合成的，而有机肥料是从天然来源（如粪肥、骨粉或堆肥植物物质）获得的。

Purpose: Fertilizers are primarily used to supply plants with essential nutrients, particularly those deficient in the soil. They are formulated to enhance plant growth, and support fruiting and flowering.

目的：肥料主要用于为植物提供必需的营养素，特别是土壤中缺乏的营养素。它们被设计用来增强植物生长，并支持结果和开花。

Usage: Fertilizers should be applied according to the specific nutritional requirements of plants. They are used throughout the growing season to promote healthy growth. However, their overuse can lead to soil and plant health issues.

用法：肥料应根据植物的具体营养需求进行施用。它们在整个生长季节都被用来促进健康生长。然而，过度使用肥料可能会导致土壤和植物健康问题。

Understanding these differences helps in selecting the right product based on the specific needs of the soil and plants, ensuring optimal growth and soil health.

理解这些区别有助于根据土壤和植物的特定需求选择合适的产品，确保最佳的生长和土壤健康。

SPECIFICATIONS OF TOPSOIL ORGANOMINERAL SOIL CONDITIONER

TOPSOIL有机矿物土壤调理剂的规格

TEST	RESULT	UNIT	METHOD REFERENCE
PRIMARY MACRONUTRIENTS **主要常量元素**			
Total Nitrogen as N (氮)	1.74	%	In-house No. FT01 (Based on MS 417: PART 3: & 1994 & AOAC991.20
Phosphorus as P_2O_5 (磷)	2.64	%	MS 417: Part 4: 1994
Total Potassium as K_2O (钾)	2.34	%	In-house No. FT02 (Based on MS 417: 1994 & 1997)
Nitrogen (N): Essential for the synthesis of amino acids, proteins, nucleic acids, and chlorophyll, nitrogen is vital for plant growth, leaf development, and photosynthesis. **Phosphorus (P):** Plays a key role in energy transfer, photosynthesis, transformation of sugars and starches, nutrient movement within the plant, and the development of roots, flowers, seeds, and fruit. **Potassium (K):** Important for protein synthesis, photosynthesis, fruit quality, and reduction of diseases, potassium also helps in water uptake and regulates many metabolic processes. **Nitrogen (氮):** 对于合成氨基酸、蛋白质、核酸和叶绿素至关重要，氮对植物生长、叶子发育和光合作用非常重要。 **Phosphorus (磷):** 在能量转移、光合作用、糖和淀粉的转化、植物内营养物质的运动以及根、花、种子和果实的发展中发挥关键作用。 **Potassium (钾):** 对蛋白质合成、光合作用、果实质量和减少疾病非常重要，钾还有助于水分吸收并调节许多代谢过程。			
SECONDARY MACRONUTRIENTS **次要常量元素**			
Calcium (钙)	8.024	%	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)
Total Magnesium as MgO (镁)	2.16	%	In-house No. FT02 (Based on MS 417: 1994 & 1997)
Sulfur (硫)	0.4082	%	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)
Calcium (Ca): Integral to cell wall structure, calcium is important for cell division and formation, enzyme activity, and starch metabolism. It also helps in neutralizing toxic substances and contributes to improved disease resistance.			

Magnesium (Mg): A central component of the chlorophyll molecule, magnesium is crucial for photosynthesis. It also aids in enzyme activation, phosphorus utilization, and plant respiration.

Sulfur (S): Essential for the production of amino acids, proteins, enzymes, and vitamins, sulfur plays a key role in chlorophyll formation and photosynthesis. It also contributes to the flavor and odor of certain plants.

Calcium (钙): 对于细胞壁结构至关重要，钙对于细胞分裂和形成、酶活性和淀粉代谢非常重要。它还有助于中和有毒物质，并有助于提高疾病抵抗力。

Magnesium (镁): 作为叶绿素分子的核心成分，镁对光合作用至关重要。它还有助于酶的激活、磷的利用和植物的呼吸。

Sulfur (硫): 对于氨基酸、蛋白质、酶和维生素的生产至关重要，硫在叶绿素形成和光合作用中发挥关键作用。它还有助于某些植物的风味和气味。

MICRONUTRIENTS
微量元素

Boron (硼)	28.7 0.00287	mg/kg %	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)
Copper (铜)	61.4 0.00614	mg/kg %	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)
Iron (铁)	16686 1.6686	mg/kg %	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)
Manganese (锰)	456 0.0456	mg/kg %	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)
Molybdenum (钼)	2.12	mg/kg	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)
Zinc (锌)	207 0.0207	mg/kg %	In-house No. F88 (Based on AOAC 975.03/ US EPA 6010D/ ICPOES)

Boron (B): Essential for cell wall formation and integrity, boron also aids in the transport of sugars across cell membranes and is important for reproductive growth.

Copper (Cu): Necessary for photosynthesis, enzyme activation, and metabolism of carbohydrates and proteins. Copper also plays a role in lignin synthesis, which is important for cell wall strength and disease resistance.

Iron (Fe): Vital for chlorophyll synthesis and as a component of many enzymes associated with energy transfer, nitrogen reduction and fixation, and lignin formation.

Manganese (Mn): Involved in enzyme systems that regulate various physiological processes, including photosynthesis, respiration, and nitrogen assimilation.

Molybdenum (Mo): Plays a critical role in the fixation of atmospheric nitrogen by legumes and in the conversion of nitrate into ammonia within the plant, affecting protein synthesis.

Zinc (Zn): Important for the synthesis of chlorophyll and carbohydrates, zinc is also involved in the regulation and support of growth hormones and enzyme systems.

Boron (硼): 对于细胞壁的形成和完整性至关重要，硼还有助于糖类跨细胞膜的运输，并且对生殖生长很重要。

Copper (铜): 对光合作用、酶的激活和碳水化合物及蛋白质的代谢必不可少。铜还在木质素合成中发挥作用，这对细胞壁的强度和疾病抵抗力很重要。

Iron (铁): 对叶绿素的合成至关重要，并且是许多与能量转移、氮还原和固定以及木质素形成相关的酶的组成部分。

Manganese (锰): 参与调节包括光合作用、呼吸作用和氮同化在内的各种生理过程的酶系统。

Molybdenum (钼): 在豆科植物大气氮的固定以及植物内硝酸盐转化为氨的过程中发挥关键作用，影响蛋白质的合成。

Zinc (锌): 对叶绿素和碳水化合物的合成很重要，锌还涉及生长激素和酶系统的调节和支持。

CATION-EXCHANGE CAPACITY (CEC)
总有机物

Cation-Exchange Capacity (Sodium Acetate) (阳离子交换容量)	134	meq/100g	USEPA 9081

Low CEC: < meq/100g
Soils with low CEC have difficulty holding onto essential nutrients and may require more frequent fertilization in smaller amounts to prevent nutrients from leaching away from plant roots.

Medium CEC: 10 to 20 meq/100g

Soils with medium CEC are somewhat effective at holding nutrients but may still benefit from regular fertilization and good management practices to maintain nutrient availability to plants.

High CEC: > 20 meq/100g

Soils with high CEC are excellent at retaining nutrients, reducing the risk of nutrient leaching. They can hold onto applied fertilizers more effectively, making nutrients readily available to plants over longer periods.

Soils or materials with a very high CEC have an exceptional ability to hold and exchange cations (positively charged ions), making them very effective at retaining nutrients and making these nutrients available to plants.

This level of CEC indicates a significant potential for nutrient retention and water-holding capacity, which can be beneficial in agricultural and environmental applications.

低CEC：<10 meq/100g

低CEC的土壤难以保持必需的养分，并可能需要更频繁地以较小量施用肥料，以防止养分从植物根部流失。

中等CEC：10至20 meq/100g

具有中等CEC的土壤在保持养分方面有一定的效果，但可能仍需定期施肥和良好的管理实践，以维持植物可用的养分。

高CEC：>20 meq/100g

具有高CEC的土壤在保留养分方面表现优秀，减少了养分流失的风险。它们可以更有效地保持施用的肥料，使养分在较长时间内可供植物使用。

具有非常高CEC的土壤或材料具有保持和交换阳离子（带正电荷的离子）的异常能力，使它们在保留养分和使这些养分可供植物使用方面非常有效。

这种级别的CEC表明具有显著的养分保留和水分保持能力，这在农业和环境应用中可能非常有益。

ORGANIC MATTER & CARBON
总有机物

Total Organic Matter (总有机物)	34.1	%	MS 417: Part 8: 1997
Total Organic Carbon (总有机碳)	19.8	%	MS 417: Part 8: 1997
Carbon : Nitrogen Ratio (碳氮比)	11:1		By Calculation

Benefits of organic matter and carbon to soil:

1. **Improvement in Soil Structure:** Organic matter helps to improve the structure of the soil. It binds soil particles into aggregates, which enhance soil aeration, water infiltration, and resistance to erosion and compaction. This makes the soil more resilient and better able to support plant growth.

2. **Enhanced Water Retention:** Soils rich in organic matter have a greater capacity to retain water. Organic materials can absorb water much like a sponge, holding it in the soil where

it can be accessed by plant roots. This is especially beneficial in dry conditions, reducing the need for irrigation and helping plants to withstand drought.

3. **Increased Fertility:** Organic matter is a key source of nutrients for plants, including nitrogen, phosphorus, and sulfur, which are released into the soil as the organic matter decomposes. This process, known as mineralization, provides a slow-release, sustainable source of nutrients that plants can use for growth.

4. **Promotion of Biological Activity:** The addition of organic matter and carbon to soil creates a favourable environment for soil organisms such as bacteria, fungi, worms, and insects. These organisms play critical roles in the soil ecosystem, including decomposing organic matter, cycling nutrients, improving soil structure, and controlling pests.

5. **Carbon Sequestration:** Soils rich in organic matter are important carbon sinks. By storing carbon in the soil, organic matter helps to mitigate climate change by reducing the amount of carbon dioxide in the atmosphere. This process, known as carbon sequestration, is crucial in efforts to combat global warming.

6. **Improved Plant Health and Resistance:** Healthy soils with high organic matter content support the growth of stronger plants that are better able to resist diseases and pests. This can reduce the need for chemical inputs like pesticides and fertilizers, leading to more sustainable agricultural practices.

7. **Buffering Capacity:** Organic matter can help buffer, or moderate, soil pH levels, making soils less acidic or alkaline. This creates a more favourable environment for plant growth. Additionally, organic matter can bind potentially harmful chemicals, reducing their availability to plants and minimizing the risk of toxicities.

有机物和碳对土壤的益处：

1. **改善土壤结构：**有机物质有助于改善土壤的结构。它将土壤颗粒结合成团聚体，增强了土壤的通气性、水分渗透性以及对侵蚀和压实的抵抗力。这使得土壤更有韧性，更能支持植物生长。

2. **增强水分保持能力：**富含有机物的土壤具有更强的保水能力。有机物质能够像海绵一样吸收水分，在土壤中保持水分，植物根部可以利用这些水分。这在干旱条件下特别有益，减少了灌溉的需要，帮助植物抵抗干旱。

3. **增加肥力：**有机物是植物所需营养素的关键来源，包括氮、磷和硫，这些营养素在有机物分解时释放到土壤中。这一过程称为矿化作用，为植物提供了一种缓慢释放、可持续的营养源，供植物生长使用。

4. **促进生物活动：**向土壤中添加有机物和碳创造了一个有利于土壤生物如细菌、真菌、蠕虫和昆虫的环境。这些生物在土壤生态系统中扮演着关键角色，包括分解有机物、循环营养、改善土壤结构和控制害虫。

5. **碳固定：**富含有机物的土壤是重要的碳汇。通过将碳储存在土壤中，有机物有助于通过减少大气中的二氧化碳来缓解气候变化。这一过程称为碳固定，对抗全球变暖的努力至关重要。

6. **改善植物健康和抗性：**富含有机物的健康土壤支持更强健的植物生长，这些植物更能抵抗疾病和害虫。这可以减少化学输入物，如农药和化肥的需要，导致更可持续的农业实践。

7. **缓冲能力：**有机物可以帮助缓冲或调节土壤pH水平，使土壤变得不那么酸性或碱性。这为植物生长创造了更有利的环境。此外，有机物可以结合潜在有害化学物，减少它们对植物的可用性，最小化毒性风险。

MOISTURE & pH
水分 & pH

Moisture (水分)	29.2	g/100g	In-house No F5 (based on AOAC 931.04 by Air Oven Method)
pH at 25°C	7.37		In-house No. F6 (Based on AOAC 945.10)

NO HARMFUL PATHOGENS
无有害病原体

Escherichia coli (大肠杆菌)	< 10 (N.D)	cfu/g	AOAC 991.14
Pseudomonas aeruginosa (铜绿假单胞菌)	< 10 (N.D)	cfu/g	In-house M088 (Based on CLMM Chapter 22)
Salmonella (沙门氏菌)	Absent	/25g	FDA/BAM; Chapter 5
Staphylococcus aureus (金黄色葡萄球菌)	< 3 (N.D)	MPN/g	FDA/BAM; Chapter 12

Directions:
说明：

For general agricultural use, the recommended application rate for TOPSOIL OSC ranges typically from 0.25 to 2.5 kg/m^2. More specifically:

Low Application Rates (0.25-0.5 kg/m^2):

Useful for light conditioning and improving nutrient efficiency in already well-balanced soils.

低施用率（0.25-0.5公斤/平方米）：

适用于轻微调理，提高已经平衡的土壤中的养分利用率。

Medium Application Rates (0.5-1.25 kg/m^2):

Can help improve water retention and nutrient capture in soils with moderate issues.

中等施用率（0.5-1.25 公斤/平方米）：

有助于改善中等问题的土壤的保水性和养分捕获能力。

High Application Rates (1.25-2.5 kg/m^2):

Best for significantly improving poor soils, such as sandy soils with very low water and nutrient retention.

高施用率（1.25-2.5 公斤/平方米）：

最适合显著改善贫瘠的土壤，如具有非常低水分和养分保持能力的沙质土壤。

It's essential to conduct soil tests before application to understand the soil's current condition and determine the most effective application rate.

在施用前进行土壤测试是至关重要的，以了解土壤的当前状况，并确定最有效的施用量。

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