

Cosmo Oil pursues the potential of ALA, a substance present in all life, to help realize sustainable societies.

The Cosmo Oil Group has been closely focusing on the effect of 5-aminolevulinic acid (ALA) on inducing plant growth, and has brought to market the Pentakeep and Penta Garden series of liquid fertilizers that contain ALA. The Group has developed high-value-added fertilizer businesses primarily in the Japanese and European markets, and is working to release these products in the United States and China. Steps are also being taken to introduce ALA in animal feed, pet food, hair growth formulas, pharmaceuticals and health food products.

Entering the Global Market with Innovative Fertilizers That Create High-Value Agriculture

After discovering that a combined dosage of iron, magnesium and other minerals with low concentrations of ALA increases chlorophyll and enhances photosynthesis activity, the Cosmo Oil Group began working on this combination to promote plant absorption of nutrition. In 2003, the Group joined with Seiwa Co., Ltd., a company widely known in the Japanese gardening sector, to commercialize and market the Pentakeep series—the world's first liquid fertilizer containing ALA—in Japan.

Cosmo Oil went on to establish Cosmo Seiwa Agriculture Co., Ltd. in 2004, and launched full-scale sales of this series outside of Japan. In addition to marketing in Japan, Europe and South Korea, Cosmo Seiwa Agriculture is developing its business in China and the United States by registering the fertilizers and building sales networks.

The Pentakeep series is having a significant impact across the steadily expanding ALA market, particularly in the Netherlands and other European countries that are eager to shift to high-value-added agriculture. Joint tests with local universities and research institutions have found that the use of Pentakeep boosts sugar content, increases yields and improves resistance to cold, heat and salinity in paprika, grapes, lettuce and numerous other crops. These properties have earned the series high praise from agricultural producers who laud them as innovative fertilizers.

In Japan, ensuring food safety and improving the rate of self-sufficiency of the food supply are major issues. The country's home gardening market has grown in recent years, and ALA has proven extremely popular in this sector for its unique ability to promote the growth and quality of plants without harming living organisms or contaminating soil. Japan's agriculture industry has also given attention to ALA, with expectations that it will contribute to agricultural development in the future.

▶ What is ALA?

ALA, or 5-aminolevulinic acid, is an amino acid present in all living organisms, and is believed to have originated with life itself 3.6 billion years ago. Previously, ALA could only be produced through chemical synthesis, however, the Cosmo Oil Group developed a fermentation process that utilizes photosynthesis bacterium. This method is key to pioneering new technology to mass-produce large volumes of high-quality ALA safely and at a low cost.



The Penta Garden series of liquid fertilizers containing ALA for home gardening. Effective enough for professionals, these fertilizers have a wide range of applications and can be used not only in flower gardens but also home vegetable gardens. Photo at left: A magazine article featuring the Penta Garden series



► **Markets for Fertilizers Containing ALA to Expand Worldwide**

Solid Fertilizers for North American and Chinese Markets

China and the United States are both large countries with vast areas of land for large-scale production of grains such as wheat, soybeans and corn, as well as fruits and vegetables. While there is significant demand for fertilizers used for growing grains in these countries, farmers also demand the lowest price. These conditions require methods that simplify the application of fertilizers and reduce the number of applications in order to cut the amount of labor required to fertilize large grain fields and to contain costs.

To make this series of fertilizers more suitable for grain crops, the Cosmo Oil Group is working to expand beyond

the existing liquid fertilizers by creating powder and solid forms of fertilizers for general-purpose application. The new formulas not only simplify application on large fields but also dissolve during rains and are effective for longer periods of time, resulting in fewer applications required before crops are harvested.

By offering a variety of formulas for a greater range of crops, the series is expected to not only improve the self-sufficiency of the food supply, but also help ensure a stable food supply by meeting growing demands for grain.

New Applications as Animal Feed and Pharmaceuticals

The Cosmo Oil Group is actively working to move beyond fertilizers and develop new ALA applications in areas such as animal feed, pet food, pharmaceuticals, cosmetics and health food. In one study, pigs that were administered ALA and a variety of irons demonstrated comparatively higher rates of weight gain. Studies have also shown that ALA can increase activity levels of older mice, and lower the rates of anemia in piglets. These findings indicate that ALA could also improve basal metabolism and immunity. The Cosmo Oil Group is conducting market research into joint development with animal feed manufacturers in Japan and other countries with the aim of developing a high-value-added animal feed business that capitalizes on the beneficial properties -of ALA.

When applied to the scalp, ALA collects at the hair roots, and when combined with iron, it has been found to facilitate extraordinary hair growth properties. The Group is currently conducting the necessary experiments to apply for quasi drug status, with plans to develop a hair growth formula business in Japan and other countries in the future.

In May 2008, Cosmo Oil established SBI ALApromo Co., Ltd. as a joint venture with SBI Holdings, Inc. This company is working on developing medicine, cosmetics and health food products that contain ALA. The Cosmo Oil Group is working to realize ALA's wide range of potential to help expand food production, promote health and ultimately contribute to sustainable societies.

Expanding Applications and Opening New Markets through ALA



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If ALA is administered in high concentrations, it results in a collapse of cells from the active oxygen generated with exposure to light. These properties have been used in the past as a curative medicine and diagnostic drug for cancer. However, only small amounts of ALA could be produced through chemical synthesis, which has made products extremely expensive and stalled the development of new uses.

However, in 1995 the Cosmo Oil Group discovered that low concentrations of ALA administered with minerals enhance plant growth. Using a process of fermentation, the Group developed a technique for mass-producing ALA in 1999, clearing the way for new uses in fertilizers, animal feed and other

products to impart the positive effects of ALA on living organisms.

Using ALA in fertilizer not only increases harvest yields and improves quality, but improves resistance to such environmental stresses as cold, heat and salinity. It also makes it possible to plant trees and crops in alkaline soil and cold climates that have previously been unsuitable for growing plants. ALA in fertilizer can be used to prevent weak harvests caused by global warming and other climatic changes.

The Cosmo Oil Group is committed to cultivating promising applications in food production and other sectors and to developing ALA as a pillar of the Group's new businesses.