

The OikoBac Line of Biological Fertilizers

A microbial process, which has generated considerable research interest in recent years, is the fixation of nitrogen from the atmosphere to the soil. Several products based on nitrogen-fixing bacteria have been developed, but most have suffered problems related to reliable performance. After many years, a breakthrough has been achieved, fundamentally based on the development of 126 new strains of Azotobacter, which had the potential in various combinations to cover virtually any situation. Mixed-strain formulations acting collectively ensured a better effect and dramatically enhanced reliability. Secondly, the investigators were convinced that Azotobacter could be induced to form huge numbers of dormant cysts, which could be stored and would remain stable in a liquid medium for considerable periods of time. Such a breakthrough would have numerous advantages over existing products, including the following:

- Many more species and strains could be included in a single blend as dormant cysts, because there would be no inter-species competition. There would also be no risk of contamination when dormant cysts could be stored in a sealed container.
- A cyst-based liquid could remain stable for two years vs three days for rehydrated microbes and six months for those supplied in a compost medium.
- Natural growth hormones produced by Azotobacter (including gibberellins, auxins and cytokinins) are very sensitive and are often degraded in a composting or brewing process. Storage as dormant cysts would preserve the full hormonal capacity.
- Finally, problems associated with **subculturing** could be avoided. Subculturing occurs when Azotobacter in a compost or brewed situation continue to subdivide and multiply. After many multiplications it is common for subsequent generations to lose some of their desirable characteristics. By contrast, a cyst-based liquid could deliver all species and strains as intended, with all beneficial qualities intact.

An Australian company (NTS) has secured world-marketing rights to these products and has licensed Ecological Resources, Inc. to market them in certain areas under the **OikoBac “NitroBio”**, **“FosfoBio”** and **“FertiBio”** trademarks, thus adding a new dimension to the already broad and versatile line of OikoBac microbiological products.

OikoBac “NitroBio”: Reliable, Low-Cost Nitrogen from the Air

OikoBac “NitroBio” is simply diluted with water and applied via boom-spray or through irrigation. Another way is by means of seed inoculation. There is no brewing or refrigeration required, and the product remains stable in the farm shed for a minimum

two years in temperatures of up to 70°C.

OikoBac “NitroBio” is also the first Azotobacter-based product with nitrogen-fixing capacity over the entire soil pH-range from 4.5 to 9 pH. Once again, the development of unique strains has enabled this problem-solving breakthrough.

Strain selection is also the key to this new product's capacity to fix nitrogen in marginal soils, even in the absence of adequate organic carbon. **Azotobacter**, like all microorganisms, needs carbon or carbohydrates. In this case the nitrogen-fixing capacity is linked to the availability of simple sugars. **Azotobacter** needs the energy of 1 gram of sugar to fix 5 to 20 mg of nitrogen. The species in **OikoBac “NitroBio”** are guaranteed to produce an average of 11 mg of nitrogen per gram of sugar.

Application Details: In horticulture, irrigated applications of 500 to 750 ml per hectare of OikoBac “NitroBio” can produce 50 to 80 kg of organic nitrogen in a season (the equivalent of 110 to 175 kg of urea - or more if you factor in the inherent instability of urea). Soaking seedlings for three hours before transplanting, using 250 ml of **OikoBac “NitroBio”**, can provide 30 to 50 kg of nitrogen.

In broadacre, a single seed treatment (involving 100 ml of OikoBac “NitroBio” per hectare) can provide 25 - 30 kg of nitrogen per hectare (the equivalent of 55 to 65 kg of urea). At a very reasonable cost per hectare, this is an attractive proposition from a nitrogen perspective alone. However, when we factor in the capacity of Azotobacter to protect against soil disease, the release of tied-up phosphorus and the fact that this species is known for its secretion of hygroscopic mucilage in the root-zone (which retains water in dry conditions), then we have a genuine broadacre bargain.

OikoBac “FosfoBio”: Tapping the Tied-Up Reserves

The major problem with acid-treated, commercial phosphate sources is their tendency to tie up with other elements in the soil and become insoluble. Super, Triple Super, DAP and MAP are all prone to "lock-ups" within 24 hours. All acid-phosphates combine with calcium (most commonly), iron or aluminum, forming insoluble compounds that are no longer available for plant growth.

OikoBac “FosfoBio” utilizes the phosphate-solubilizing characteristics of Azotobacter to the maximum. Numerous strains capable of operating in diverse conditions are combined in the form of stabilized, dormant cysts in a liquid medium. This blend also includes a proven phosphate liberator called *Bacillus megaterium*. After decades of phosphate fertilizing, soils all over the world now contain many billions of dollars of insoluble phosphate. The **OikoBac “FosfoBio”** species literally feed upon this huge reserve, effectively converting a frozen bank account into available funds. **OikoBac “FosfoBio”** can also dramatically reduce the phosphate release time associated with the use of rock phosphate products. **OikoBac “FosfoBio”** is applied at 500 ml to 1 litre per hectare in horticulture through irrigation or via boom-spray. Ideally it should always be included with OikoBac “NitroBio” to ensure maximum nitrogen fixation

(to guarantee a supply of ATP for nitrogen fixation).

Note: We always recommend the use of molasses and Liquid Fish products with both of these soil-based additives to optimize response.

OikoBac “FosfoBio” can also be diluted and applied to seedlings before transplanting, at a rate of 250 ml per hectare. Soaking seedlings for three hours ensures full root-zone penetration, which is then maintained for the complete life of the plant.

In broadacre, OikoBac “FosfoBio” is applied at 100 ml per hectare as a seed dressing. This application can usually supply 12 to 15 kg of phosphorus per hectare.

OikoBac “FertiBio”: The Four-Dimensional Biological Foliar

OikoBac “FertiBio” is a genuine original. It is a complex, living fertilizer specifically designed for foliar applications. After a decade of extensive trials, the manufacturers and patent holders have been able to delineate a detailed cost analysis for this product, which involves an average Investment-to-Benefit ratio of 1:5. This translates to a \$25 return for every \$5 invested in the product.

In broadacre, **OikoBac “FertiBio”** is applied at 125 ml per hectare, in 70 to 100 litres of water.

In horticulture it is applied at a dilution rate of 1:1000, involving an active ingredient component ranging from 250 ml to 1 litre per hectare.

In cropping situations, **OikoBac “FertiBio”** is foliar-sprayed 30 days after germination and again 30 days later.

The product offers four distinct modes of action, resulting in a complex, multi-dimensional growth response:

- **OikoBac “FertiBio”** includes finely tuned nitrogen-fixers, which utilize carbon exudes from the leaf surface to fix nitrogen from the atmosphere directly into the leaf. This is the first time that significant quantities of natural nitrogen have been supplied through microbial activity on the foliage.
- **OikoBac “FertiBio”** contains a range of beneficial bacteria that release natural growth hormones as metabolic byproducts. These natural stimulants include gibberellins, cytokinins, auxins and indole acetic acid (IAA) - all capable of generating powerful growth and yield response.
- This unique foliar fertilizer also contains species that produce vitamins, including the B group, Vitamin E and Vitamin C. Recent American research suggests that several of the B vitamins can act as growth stimulants, and Vitamins E and C are important for disease resistance.
- **OikoBac “FertiBio”** also includes a range of organisms that can provide protection against disease. The explanation for this anti-fungal action is as follows:

a. Azotobacter secretes low-molecular substances, known as **siderophores**, which bind available iron and make germination of pathogenic fungi difficult (Iron is an essential ingredient involved in the

transformation of an inactive spore to an active pathogen).

b. Azotobacter secretes an antibiotic with a structure similar to **anisomycin**, which is a documented fungicidal antibiotic.

c. Azotobacter in sufficient numbers will out-compete pathogens for food. Note: Some of the pathogens that have been controlled by Azotobacter in the soil and on the leaf include: [Alternaria](#), [Fusarium](#), [Collectotrichum](#), [Rhizoctonia](#), [Macrophomina](#), [Diplodia](#), [Batryiodiplodia](#), [Cephalosporium](#), [Curvularia](#), [Helminthosporium](#) and [Aspergillus](#) (there is published research data related to the effect of Azotobacter on each of the above species).

OikoBac “FertiBio” survives on the leaf surface for 21 to 30 days. A sticking agent should be used in wet conditions.