SUSTAINABLE FARMING SOLUTIONS

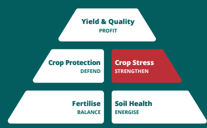
VITAZYME® an All Natural Biostimulant Concentrate

Vitazyme - the science

Summary of independent research on multiple active ingredients

The most researched bio-stimulant on the market

- Over 20 years of research - www.systainablefarming.com.au has a selection including Australian trials
- 1,000+ international studies - plantdesigns.com/vitazyme



The Science

Vitazyme has multiple active compounds that are found naturally in plants and are active at very low concentrations.

Research has shown that these compounds are used by plants to achieve optimal productivity, particularly by offsetting unfavourable influences of the environment (stresses, disease etc). They induce changes in growth and development that are the result of a cascade of biochemical reactions, which can be initiated via direct action of the active on the genome or by an extra-genetic route. Both routes assume the participation of a system of secondary messengers and can act together (Khripach et al, 2000).

The main compounds in Vitazyme are - brassinosteroids, triacontanol, glycosides & B vitamins.

We've summarised independent research on these actives in this leaflet.

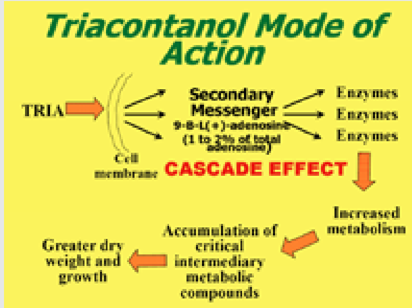
Vitazyme itself has been extensively researched since it was first sold in the 1990's. There are over 1,000 international studies, including numerous Australian studies in the last few years.

You can check out the results for your crop at www.vitazyme.com

Australian trials can be found at www.sustainablefarming.com.au

Vitazyme has multiple actives and multiple modes of action which means it is more likely to respond to the ever changing environmental stresses that are agriculture.

Triacontanol - in Vitayzme



This well researched compound is found in relative abundance in Vitazyme at 0.17mg/ml (in 1 litre/ha, 170mg/ha is applied). It can activate plant growth at extremely low concentrations, less than 1mg/ha .

Triacontanol is a natural component of plants. Many investigators have shown Triacontanol influences photosynthesis, nutrient uptake, and enzymatic activity (Kumaravelu, 2000: Ries, 1985).

A selection of research on Triacontanol:

- Increase vegetative growth, chlorophyll content and dry weight of plants (Ries, 1985)
- Enhanced shoot growth, fresh weight, chlorophyll content and the number and length of roots (Tantos, 2001)
- Effective in both the multiplication and rooting phases of micro-propagation (Tantos, 2001)
- Yield increases and improved N uptake (Borowska, 2011)
- Stimulates dry matter accumulation in leaves (Borowska, 2011)
- Increases the content of photosynthetic pigments and CO2 assimilation (Kumaravelu, 2000, Mistra, 1991)
- Increases seed weight and chlorophyll content of leaves (Malabadi, 2005)

Independent International Research papers support these findings on Triacontanol. Call us for a copy.

- *Borowska, N et al, Effect of triacontanol on the productivity of yellow lupin, Journal of Central European Agriculture, 2011: 12(4), 680-690.*
- *Eriksen. A et al, Comparative analyses of the effect of triacontanol on photosynthesis, photorespiration and growth of tomato and maize, Planta, 1981: 152: 44-49*
- *Fraternale, D et al, The effect of triacontanol on micropropagation and on secretary system of Thymus mastichina, Plant Cell, Tissue & Organ Culture, 2003: 74: 87-97*
- *Kumaravelu, G et al, Triacontanol induced changes in the growth, photosynthetic pigments, cell metabolites, flowering and yield of green gram. Biologia Plant. 2000: 43 (2): 287 - 290.*
- *Malabadi, R et al, Effect of triacontanol on the mmicropropagation of costus speciosus using rhizome thin sections. Vitro Cell. Dev.Biol-Plant, 2005:41: 129-132*
- *Mistra, A et al, Effect of triacontanol formulation Miraculan on photosynthesis, growth, nutrient uptake and essential oil yield of lemongrass. Plant Growth Reg 1991.*
- *Ravindra, B et al, Effect of triacontanol on the micropropagation of Costus Speciosus using rhizome thin sections, Vitro Cell, Dev. Biol - Plant, 2005 41: 129-132*
- *Reddy, B, The effect of triacontanol on micropropagation of Capsicum frutescens and Decalepis hamiltonii, Plant Cell, Tissue and Organ Culture, 2002: 71: 253 - 258.*
- *Ries, SK, Regulation of plant growth with triacontanol, CRC Critical Reviews in Plant Sciences, 1985:Vol 2, Issue 1, CRC Press Inc, Florida.*
- *Tantos, A et al, Triacontanol supported micro propagation of woody plants, Plant Cell Reports, 2001: 20: 16 - 21*

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Brassinosteroids - in Vitayzme

Called the "growth regulator of the 21st Century", four brassinosteroids have been isolated from Vitazyme - homobrassinolide, dolicholide, homodolicholide and brassinone.

Since the discovery of Brassinosteroids, over 1000 articles have been published on various aspects of their research, focusing on their occurrence, modes of action and ability to promote yield (Kripach, 2000).

Brassinosteroids are a group of naturally occurring plant steroids which are important for a broad spectrum of cellular and physiological processes, including stem elongation, pollen tube growth, leaf bending and epinasty, root inhibition, fruit development, ethylene biosynthesis, proton pump activity, xylem differentiation, photosynthesis and gene expression (Kang et al 2011). Moreover, BR's can induce plant tolerance to a variety of biotic and abiotic stresses (Xia et al, 2009).

Brassinosteroids are effective at extremely low concentrations. They occur in Vitazyme at about 0.03mg/ml. At the standard application rate of 1 litre per ha, 30mg/ha is applied, which is well within the accepted active range of 20-50mg/ha .

A selection of research on Brassinosteroids

- Improve yield and quality of crop (Literature Review, Kang, 2011; Prusakova et al, 1999 - potatoes)
- Regulate uptake of ions into plant cell, reducing accumulation of heavy metals (Khripach et al 1995, 1996)
- Improved production and quality in new crops (Belova, 1999)
- Improves growth & photosynthesis through enhanced antioxidant system in presence of chilling stress (Cucumbers - Fariduddin,2011)
- Accelerated ripening in tomatoes (Ali et al, 2006)
- Improved production of grapes (Kripach, 2000)
- Natural disease protection with cucumber, barley (Kripach, 2000)
- Protective effect with potatoes. Spraying at the beginning of bud formation resulted in healthier potatoes (Khripach, 2000)
- Helps protect cells from oxidative damage induced by high temperature stress (Sam et al, 2001, Dhaubhadel et al, 1999,2002, Singh and Shono, 2005)
- Helps with water stress by an elevated antioxidant system - decreased transpiration rate, stomatal conductance and MDA content of seedlings (Fariduddin et al, 2009a)
- Impact of hypoxia stress ie oxygen deficiency in the root -zone (a major cause of yield reduction) reduced by enhancing supply of sugars to hypoxic roots (Kang et al, 2009)
- Protects crops from the toxicity of herbicides, fungicides and insecticides as a result of increased capacity of CO2 assimilation and antioxidant enzymes (Sondhi et al, 2008, Xia, 2006)

Independent International Research papers support these findings on Brassinosteroids. Call us for a copy.

- *Ali, B, Effect of root applied 28-homobrassinolide on the performance of Lycopersicon esculentum, Sci Hortic, 2006: 110: 267-273*
- *Belova, TA, Efficacy of growth regulator epin for soy-bean introduction. In Shevelucha et al, Regulators of plant growth and development, 1999, Moscow: Agricultural Academy.*
- *Dhaubhadel, S et al, Brassinosteroid functions to protect the translational machinery and heat-shock protein synthesis following thermal stress. Plant J: 2002:29: 681-691.*
- *Dhuabhadel, S. Treatment of 24-epibrassinolide, a brassinosteroid, increases the basic thermotolerance of Brassica napus and tomato seedlings. Plant Mol. Biol. 1999: 40: 333-342.*
- *Fariduddin, Q et al, 28-homobrassinolide improves growth and photosynthesis in cucumis sativus through an enhanced antioxidant system in the presence of chilling stress, Photosynthetica 2011: 49(1): 55-64*
- *Fariduddin, Q et al. Effect of 28-homobrassinolide on the drought stess-induced changes in photosynthesis and antioxidant system of Brassica juncea L. Acta Physiol. Plant. 2009:31: 889-897*
- *Gomes, M, Physiological effects related to brassinosteroid application in plants, In Hayat,S, Ahmad.A (Eds), Brassinsteroids: A Class of Plant Hormone 2011 - Good Review*
- *Kang, Y et al, Role of brassinosteroids on horticultural crops. In Hayat,S, Ahmad.A (Eds), Brassinsteroids: A Class of Plant Hormone 2011 - Good Review*
- *Khripach, VA et al, Twenty years of brassinosteroids: steroidal plant hormones warrant better crops for the 21st Century, Annals of Botany. 2000: 86: 441 - 447.*
- *Khripack, VA, Zhabinskii, VN, deGroot, VN, Brassinosteroids, a new class of plant hormone, Academic Press, California 1999.*
- *Nakashita H et al, Brassinosteroid functions in a broad range of disease resistance in tobacco and rice, Plant J. 2003 Mar: 33(5): 887-98*
- *Meudt, W, Investigations of the mechanism of the brassinosteroid response, Plant Physiol. 1987: 83:195-198*
- *Prusakova LD et al, The use of emistim, epibrassinolide and uniconazole to overcome quality difference of buckwheat grains. Agrarian Russia. 1999: 41-44.*
- *Sam, O et al, Effect of a brassinosteroid analogue and high temperature stress on leaf ultrastructure of Lycopersicon esculentum. Biol Plant. 2001:44: 213-218.*
- *Sasse, J, Physiological actions of brassinosteroids: an update, J Plant Growth Regul, 2003: 22: 276-288*
- *Singh, et al, Physiological and molecular effects of 24-epibrassinolide, a brassinosteroid on thermotolerance of tomato, Plant Growth Regul, 2005: 47: 111-119.*
- *Sondhi,N et al, Isolation of 24-epibrassinolide from leaves of Aegle marmelos and evaluation of its antigenotoxicity employing Allium cepa chromosomal aberration assay. Plant Growth Regul. 2005: 54: 217-224.*
- *Xia, X et al, Reactive oxygen species are involved in brassinsteroid-induced stress tolerance in cucumber, Plant Physiol. 2009: 150: 801-814*
- *Yin et al, Three related receptor-like kinases are required for optimal elongation in Arabidopsis thaliana, Department of Genetics, Plant Science Institute, 2008.*

Harness the power of nature

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Glycosides and B Vitamins - in Vitayzme

Glycosides are involved in the plants secondary metabolism and are thought to play a key role in keeping all the plant's systems working properly. A common role of secondary metabolites is a defence mechanism against pathogens. The glycoside compound in Vitazyme has been shown in greenhouse trials, to consistently increase dry matter production of crops.

Vitazyme contains 0.45mg/100g of Vitamin B1 (thiamin), 0.03mg/100g of Vitamin B2 (riboflavin) and 0.19mg/100g of Vitamin B6 (pyridoxine). Vitamins have been shown to promote plant growth, yields and are integral in inducing resistance to disease. Thiamine, in addition to its nutritional value, induces systemic acquired resistance (SAR) in plants. Thiamine-treated rice, Arabidopsis (Arabidopsis thaliana), and vegetable crop plants show resistance to fungal, bacterial, and viral infections (Zhang, 2009). It has also been shown that riboflavin induces pathogen resistance in plants by priming of (plant) defence responses toward infection (Il- Pyang, 2005).

Information & Advice

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