



Clinically-Researched Standardized Kesum Extract for Brain Health

A novel comprehensive approach to cognitive wellness



- ▣ Patented for cognitive application
- ▣ Clinically-researched for cognitive health
- ▣ High in antioxidants
- ▣ Standardized & water-soluble
- ▣ Natural & derived from plant



Patented & Standardized

Kesum Leaf, Pygmy 'Smart Weed' Extract



INTRODUCTION

Kesum (*Persicaria minor* @ *Polygonum minus*) is an indigenous plant of Malaysia and South East Asia, also known as 'Pygmy Smart Weed'. Traditionally used to flavour soups and dishes, it is also consumed as a salad or 'ulam' for anti-aging ('awet muda'), aiding digestion, alleviating dandruff and as a post-partum tonic.

BioKesum® is a market-ready botanical ingredient for:

-  **All-natural dietary health supplements**
-  **Functional food & beverage**
-  **Nutraceutical & cosmeceutical applications**

BIOKESUM® HEALTH BENEFITS

Confusion : 18% ↓

Processing speed: 12% ↑

Brain activation (DLPFC**): 19% ↑

Visual memory : 10% ↑

Completion of complex task : 12% ↑

BDNF* : 2% ↑

Improved mood (tension, confusion, anger & anxiety) : 33% ↑

Supports acetylcholine availability ***

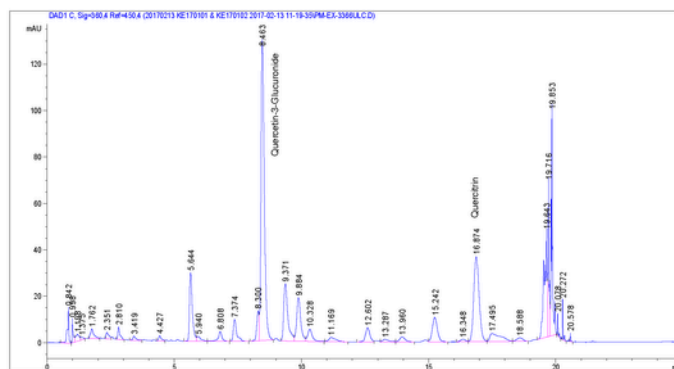
*BDNF - Brain derived neurotrophic factor: Protein that affects neuroplasticity and synaptic function. Low BDNF levels are associated with depression, while higher levels are linked to resilience against stress.

**DLPFC - Dorsolateral Prefrontal Cortex: Region of the brain involved in short term memory, logical thinking, problem-solving, and planning. It also regulates sustained attention, managing, competing demands, impulse control and emotions.

***Acetylcholinesterase inhibition by 68% (George et al, 2014)

STANDARDIZATION

Standardization is a process where the beneficial compounds in the extract are quantified and controlled for consistency. BioKesum® is standardized to total polyphenol content (TPC >100mg/GAE per g dE) and the powerful flavanol Quercetin-3-Glucuronide (Q3G >0.45%) that have been scientifically proven to support brain health and improve cognitive function.



WHY CHOOSE BIOKESUM® EXTRACT?

Facts	Description
History of use	Established use in traditional and culinary practices of Malaysia and South East Asian countries
Evidence	High antioxidant capacity of BioKesum® supported with pre-clinical & clinical studies
Source	Available all year round – cultivated with fast turnover and abundant in wet-market circulation
Clinically researched	- Prevention of oxidative damage - Support brain health – memory and executive function - Improved mood and reduction of negative mood profiles (tension, anger, confusion and anxiety)
Patented	Cognition/Memory -PCT/MY2013/000033

QUALITY ASSURANCE & CONTROL

Biotropics emphasizes quality control from sourcing to final packaging. Incoming raw material is sourced from selected suppliers for optimum consistency, and the material itself tested for heavy metals, pesticides, aflatoxins and microbial levels. All subsequent stages of extraction, processing and manufacturing are monitored continuously based on international reference standards and validated test methods.

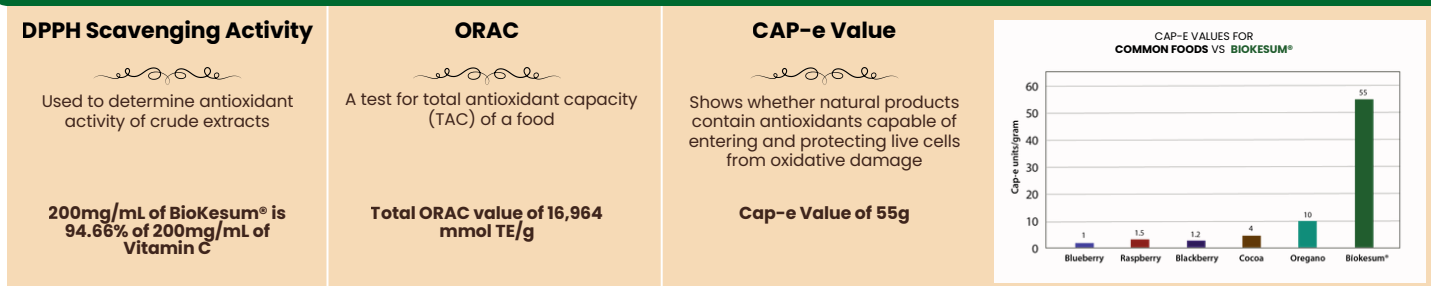


Scientifically Validated

Kesum Leaf, Pygmy 'Smart Weed' Extract

HIGH IN ANTIOXIDANTS

Kesum has been shown to have the highest total phenolic content among other 'Ulam' plants and significantly higher ($P < 0.05$) than ginger and turmeric¹. BioKesum® shows strong antioxidant properties that slow the oxidative processes and free radical damage as demonstrated by:



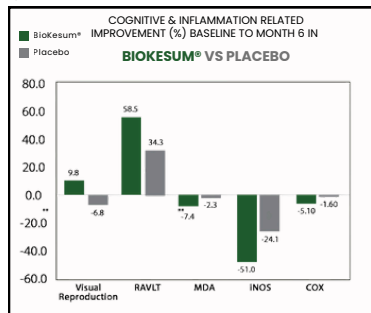
COGNITION, MEMORY & MOOD

BioKesum® possesses antioxidant and anticholinesterase activity, and demonstrated enhanced cognition in vivo². 100mg/kg of BioKesum® did not show scopolamine induced deficit in learning and memory (equivalent to donepezil) and Gingko biloba². This effect is further validated in three clinical trials looking into cognitive function and memory in healthy subjects.

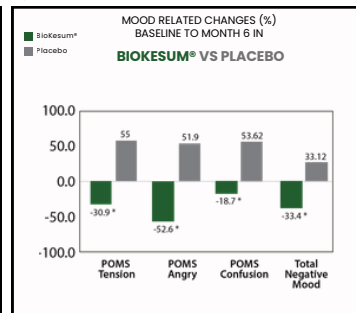
STUDY 1: Lau, et. al, 2020

Product	BioKesum®
Dose and Duration	500mg/day for 6 months
No. of Subjects, Age	30, 60-75 years old
Results	- Visual Memory improvement (+9.8%)(Graph 1) - Reduction of inflammatory markers* (INOS -51%, MDA -7.4%, COX -5.1%) (Graph 1) - Reduced tension (-30.9%), confusion (-18.7%), anger (-52.6%) and total mood disturbance (-33.4%) (Graph 2) - Brain-derived neurotrophic factor, BDNF increased by 2% vs. -19% placebo - Dorsolateral prefrontal cortex, DLPFC activation was increased by 19.61% vs -47% placebo

GRAPH 1



GRAPH 2

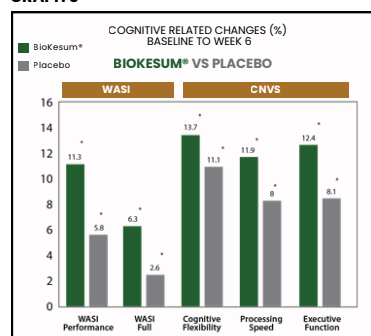


*MDA (Malondialdehyde), INOS (Inducible Nitric Oxide Synthase) and COX (Cyclooxygenase) are indicators on inflammatory response. MDA shows cell stress, INOS makes a defense chemical (nitric oxide) and COX drives the inflammation process.

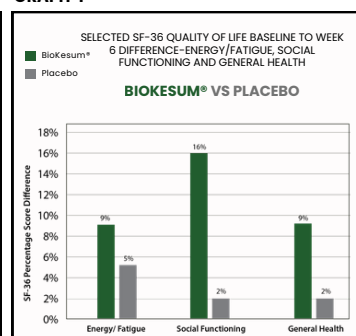
STUDY 2: Shahar, et. al, 2017

Product	BioKesum®
Dose and Duration	500mg/day for 6 weeks
No. of Subjects, Age	35, 35-55 years old
Results	- Improved Cognitive Test Score (Wechsler Abbreviated Scale of Intelligence, WASI) (+11.3%) (Graph 3) - Improved cognitive flexibility (+13.7%), processing speed (+11.9%) and executive function (+12.4%) (Graph 3) - Improvement of Profile of Mood States, POMS: Reduced tension (-21%), depression (-31%), anger (-26%) and total mood disturbance (-34%) - Improved energy and reduced fatigue (+9%), social functioning (+16%) and general health (+9%) (Graph 4)

GRAPH 3



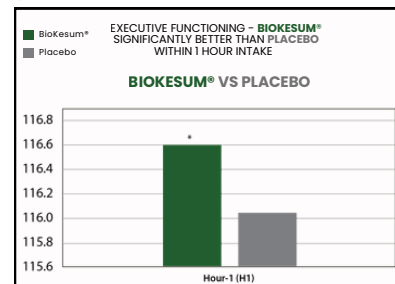
GRAPH 4



STUDY 3: Udani, 2013

Product	BioKesum®
Dose and Duration	300mg before test (1 time supplementation)
No. of Subjects, Age	20 (crossover model = 40), ≥35 and ≤65 years old
Results	- Significant improvement after 1 hour ($p < 0.05$) in executive function (Graph 5) - Improvement in cognitive flexibility, reaction time, working memory and sustained attention - Decrease in tension, depression and anger

GRAPH 5



References:

- Malizura, M., Aminah, A. and Wan Aida, W. M. Total phenolic content and antioxidant activity of Kesum (Polygonum minus), ginger (Zingiber officinale) and turmeric (Curcuma longa) extract. International Food Research Journal 18: 529-534 (2011)
- George A, Ng CP, O'Callaghan M, Jensen GS, Wong HJ. In vitro and ex-vivo cellular antioxidant protection and cognitive enhancing effects of an extract of Polygonum minus Huds (LineminusTM) demonstrated in a Barnes Maze animal model for memory and learning. BMC Complement Altern Med. 2014 May 19;14:16.
- Study 1: Lau H, Shahar S, Mohamad M, Rajab NF, Yahya HM, Din NC, Hamid HA. The effects of six months Persicaria minor extract supplement among older adults with mild cognitive impairment: a double-blinded, randomized, and placebo-controlled trial. BMC Complement Med Ther. 2020 Oct 19;20(1):315.
- Study 2: Yahya, Hanis & Shahar, Suzana & ISMAIL, SITI & Aziz, Ainor & Normah, Che Din & Abdul Hakim, Bibi Nabillah. (2017). Mood, Cognitive Function and Quality of Life Improvements in Middle Aged Women Following Supplementation with Polygonum minus Extract Sains Malaysiana. 46. 245-254. 10.17576/jsm-2017-4602-09.
- Study 3: Jay K Udani, "Effects of SuperUlam on Supporting Concentration and Mood: A Randomized, Double-Blind, Placebo-Controlled Crossover Study," Evidence-Based Complementary and Alternative Medicine, vol. 2013, Article ID 238454, 10 pages, 2013. doi: 10.1155/2013/238454



EXTRACT DESCRIPTION

Botanical Name	Persicaria minor (Polygonum minus)
Class	Magnoliopsida
Order	Polygonales
Family	Polygonaceae
Common Name(s)	Pygmy 'Smart Weed', Small water pepper
Country of Origin	Malaysia
Shelf Life	3 Years
Parts Used	Leaves
Extraction Method	Water (no carrier)

EXTRACT SPECIFICATION

Test Parameter	Method/Reference	Specification
Appearance Color/Form & Texture Odor/Flavour Extraneous Material	In house	Dark Brown fine powder Characteristic odour/ Bitter
Physical Characteristics Average Mesh Size Moisture Content	USP 786 In house	90% NMT 120 Mesh NMT 10%
Bioactive Content Quercetin-3-glucuronide Total phenolic content	HPLC ISO 14502-1:2005(E)	NLT 0.45% NLT 100mg GAE/g dE
Heavy Metal Lead (Pb) Mercury (Hg) Arsenic (As) Cadmium (Cd)	USP<233>, ICPMS	NMT 1.0 ppm NMT 0.5 ppm NMT 5.0 ppm NMT 0.3 ppm
Microbial Limit Test Total Aerobic Microbial Count Total Yeast & Mould Salmonella Escherichia coli Staphylococcus aureus Bile-tolerant gram-negative bacteria	British Pharmacopeia (Harmonised Method)	NMT 10.000 cfu/g NMT 100 cfu/g Absent in 25g Absent in 1g Absent in 1g NMT 100 cfu/g

"NMT: Not more than; NLT: Not less than"



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ABOUT BIOTROPICS MALAYSIA

Blessed with an abundance of bio-resources, Malaysia is home to one of the world's oldest rainforests. Over generations, its people have acquired an intimate knowledge of plants and their uses for health and beauty.

At Biotropics Malaysia Berhad, we are driven by our philosophy of producing superior natural health products for local and international markets. We achieve this by transforming traditional approaches to health and well-being into tomorrow's innovative health solutions, verifying time-honored traditions through state-of-the-art science.