

Palm Phenolics: Bright & Exciting

How would the markets react?



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Venture Success – P.I.T.S.

P.I.T.S.

The P's

- Program
- Purpose
- People
- Patents
- Processes
- Publications
- Products

The I's

- Intellectual
- Innovation
- Interdisciplinary

The T's

- Technology
- Truth
- Transparent

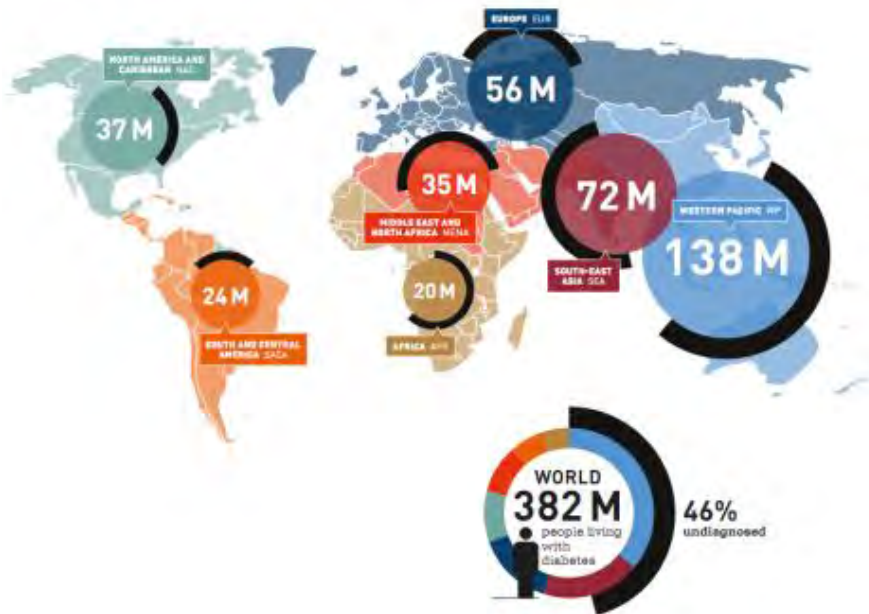
The S's

- Scientific
- Sustainable
- Scalable
- Safety



Target Health Markets for Palm Fruit Bioactives

Number of people with diabetes by IDF Region, 2013



International Diabetes Federation, Atlas 2013

Diabetes:

- ~**382,000,000 individuals** have Diabetes
- **1 billion+** are pre-diabetic
- **\$500 Billion USD** global health care expenditure

Age-Related Macular Degeneration (AMD):

- 2nd highest cause of **irreversible blindness**
- **30,000,000 individuals** suffer vision impairment due to AMD (2013)
- **\$343 Billion USD** Global healthcare cost

Neuro-degenerative conditions:

- **36,000,000 individuals** have Alzheimer's (2010)
- Expected to grow over 3x to **115,000,000** by 2050
- **\$640 Billion USD** global healthcare cost

Nutraceutical Market Drivers

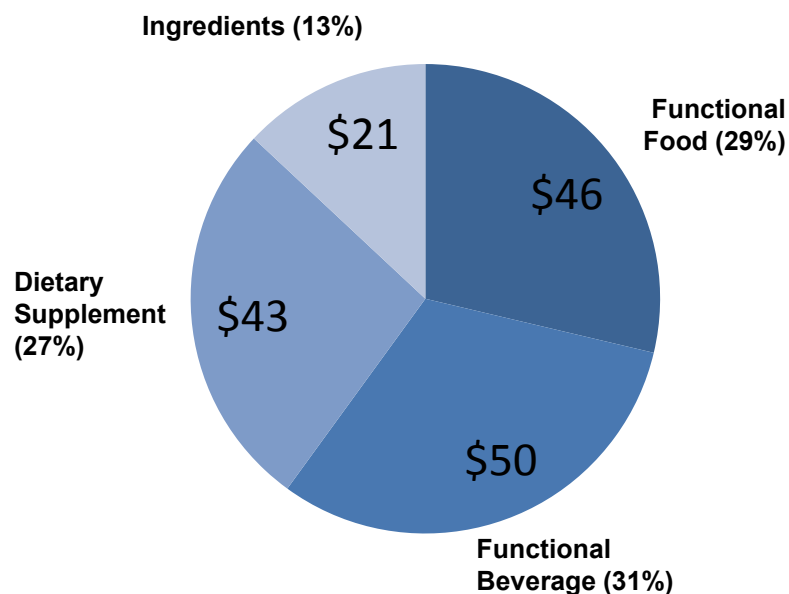
Market drivers

- Growth in recognition and awareness of Natural Products
- Growth in size of aging population over 60 yo (~1B by 2020)
- Increase in scientific and clinical data supporting products
- Increase in preventative healthcare and self medication
- Increase in sophistication and size of distribution channels
- Increase in individuals' disposable income
- High growth rate and attractive margins for differentiated products

Nutraceuticals Market

\$161B Worldwide Nutraceutical Market in 2011

(\$ B)



*Nutraceutical Product Market (2007-2017) and Frost and Sullivan (2010)

*Internal Market Est.

Worldwide Nutraceutical Market Growth

(\$ B)

	2011	2017E	CAGR
			'11 – '17
Global Market	\$ 161	\$ 235	6.3%
Market:			
North America	64.4	80.4	
Western Europe	38.7	58.8	
Asia Pacific	48.3	73.5	
Rest of World	9.7	23.5	

*Nutraceutical Product Market (2007-2017) and Internal Market Est.

*Bourne Partners (2013) and Frost and Sullivan (2010)

Global Strategy Success Factors For PFB

- Investment in R&D (products, clinical/preclinical studies to support health claims)
- Develop High Quality Malaysian based GMP manufacturing capacity for PFB
- Implement marketing programs to educate and increase awareness of PFB benefits
- Invest in branding to differentiate and position PFB as first in class product that is effective and value for money
- Initiate a worldwide development and distribution channel thru internal programs and partnerships with strong and highly reputable groups
- Invest, attract and enhance world class employee talent

Malaysia's Oil Palm Supply Advantage

- **Malaysia's Global Role in oil palm industry**

- 39% of world palm oil production
- 44% of world exports of palm oil

- **2nd largest producer of palm oil**

- **19 million metric tonnes** of crude palm oil



19 mmt Crude Palm Oil
~\$20B revenue
\$0.80 – 1.00 USD per kg

- **Palm Fruit Bioactives (PFBs)**

- **~45 million metric tonnes** of Vegetation Liquor generated in palm oil production
- **~1.5 million metric tonnes** of PFB solids can be generated from Vegetation Liquor
- Potential to generate **100-1000x more revenue** per kg than crude palm oil



~1.5 mmt
Palm Fruit Bioactive Solids → **\$200-1000**
USD per kg

Global Goal for PFB

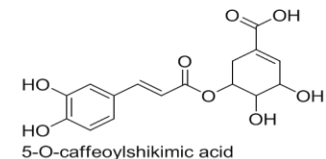
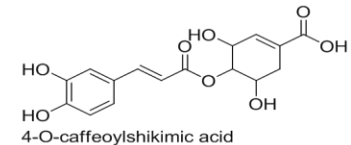
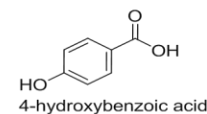
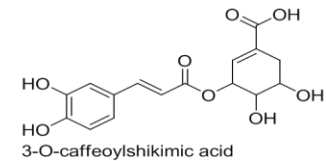
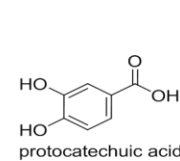
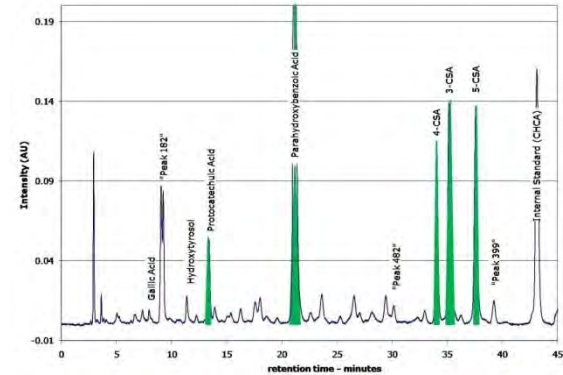
- To develop and commercialize high performance novel bioactive products made from Palm Fruit Bioactives (PFBs) for the prevention of age related degenerative disease conditions and improve the quality of life for individuals worldwide

Unique Manufacturing Technology

- Novel structure, property, and function
- IP (manufacturing, processing, application, composition)
- Organic Solvent-free green manufacturing process
- Highly efficient and scalable manufacturing
 - Economical and commercially feasible

Proprietary Technology for PFB

- Derived from Oil Palm manufacturing vegetative liquor product
 - Ample WW supply
- Demonstrated to have unique chemical signature that is not easily duplicated
 - No industrial source of caffeoylshikmic acid isomers
- Strong IP portfolio covering manufacturing and applications of PFB
- High potent bioactivity with potential for clinical benefits



5 unique marker compounds in PFB



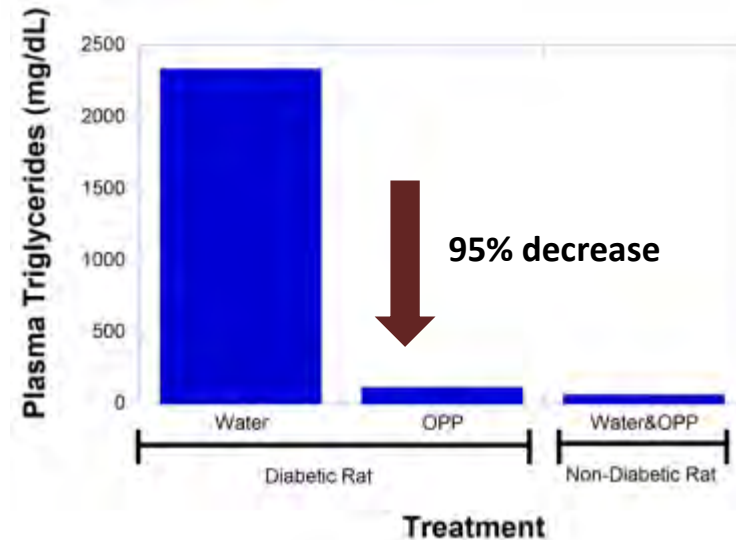
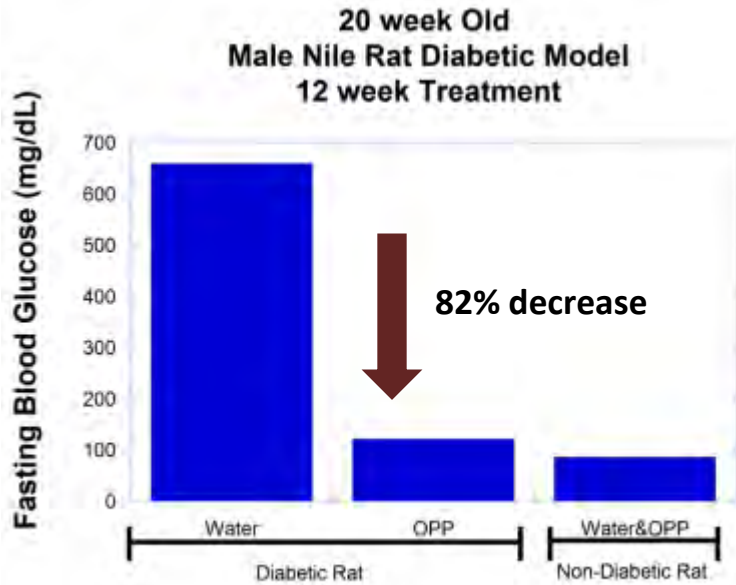
MPOB/Phenolaeis: Intellectual Property

- **23 Internationally filed/issued patents:**
 - licensed from MPOB to Phenolaeis
 - US and PCT formal applications in progress
- ***IP category breadth:***
 - **Manufacturing Process Patents** for the extraction of phytochemicals from vegetation liquor derived from oil bearing fruit
 - **Composition of matter** for antioxidant compounds comprising oil palm phenolics
 - **Methods of use** of phenolics compositions:
 - For example: to treat or prevent ***diabetes mellitus***, treatment of ***neurodegenerative conditions***, and ***macular degeneration***

Competitive Position

- Palm Fruit Bioactives (PFB)
 - First in class natural product with demonstrated broad biologic activity
 - Extensive preclinical and clinical work performed demonstrating safety and benefit:
 - Age related macular degeneration (AMD)
 - Controlling and decreasing blood pressure
 - Controlling and managing Diabetes Mellitus
 - Nitric Oxide modulated inflammation
 - Neurological applications
 - World class Scientific Research Team
 - No currently known industrial or alternative source for PFB
 - Demonstrated manufacturability (Manufacturing Pilot Plant built 2004)
 - Demonstrated product stability
 - Beneficial characteristics (liquid/powder forms; water soluble)
 - IP for manufacturing and applications of PFB issued

Diabetic Animal Model Study



- **Diabetic Model**

- Non-Fasting Blood Glucose Levels **3x greater** for Diabetic versus non-Diabetic rats

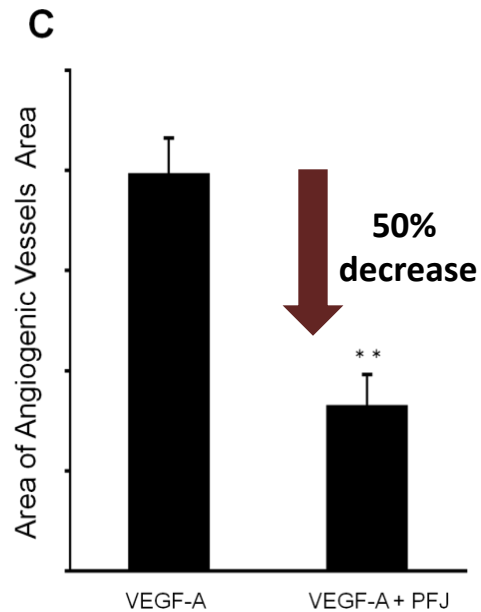
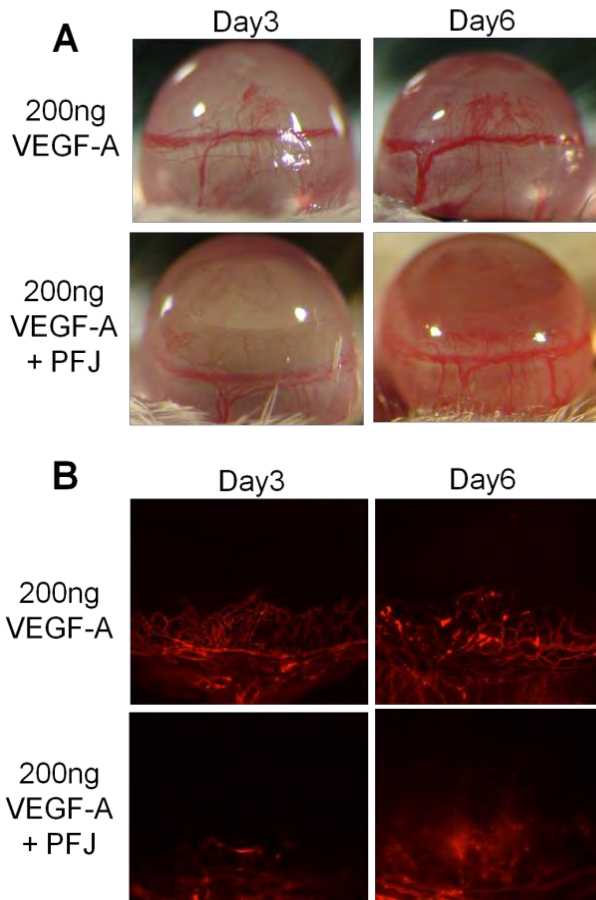
- **OPP** consumption shown to substantially **reduce** Fasting Blood Glucose and Plasma Triglyceride Levels in Diabetic rats

- Necropsy observations:

- **Normal** appearance of **liver and kidney size** in OPP group
- **Fat deposits** associated with diabetic rats **not observed** in OPP group



Macular Degeneration Animal Model



- AMD is the most common cause of vision loss worldwide in individuals over 50 years
- Vascular endothelial growth factor A (VEGF-A) has been identified as the key molecule responsible for AMD
- Anti-VEGF treatment via intravitreal injections is the only therapy to date
- PFB consumption significantly reduces neovascularization induced by VEGF-A



International Recognition and Awards received by MPOB for PFB Research



- ITEX Gold Medal (2014)
- National Scientific Innovation Award / MICCOS* (2013)
 - * Malaysian International Commodity Conference and Showcase
- Knight of the International Order of Merit of Inventors / IOMI* (2010)
 - * The International Order of Merit of the Inventors
- Anugerah Inovasi Negara (National Innovation Award) / MOSTI* (2007) Finalist
 - * Ministry of Science, Technology and Innovation, Malaysia
- Gold Medal / Biotechnology Asia (2006)
- Tech Museum Awards / The Tech Awards (2002)
- Gold Medal / Inventions Geneva (2002)
- Asian Innovation Awards / The Wall Street Journal Asia (2001)
- Gold Award / Invention & Innovation Competition* (2001)
 - * Expo Science & Technology_2001



MOSTI
Ministry of Science, Technology
and Innovation Malaysia



Competitor Risks

- Established Marketing and Distribution Channel
 - Development of key partnerships
- Competitive phenolics that can be obtained from Olive Oil Leaves, Pomegranate Skin, Citrus waste or vegetable or fruit processing waste
 - Structure and organization of PFB advantages over potential substitutes
 - CSA structural rarity in nature
 - Difficultly to prepare/process (water soluble)
 - Stability of PFB (shelf life)
 - Raw material supply availability

Channels to Market: Marketing and Distribution

- **Phase I:** Develop Strategic Partnerships with well established groups to commercialize private label products for distribution and sales
- **Phase II:** Develop hybrid distribution channel (independent and direct sales) to sell Branded Products

Conclusion: Success Drivers

Technology – Palm Fruit Bioactives (PFBs)

- **Unique polyphenolic** water soluble composition with a native profile
- Potent **anti-oxidant and anti-inflammatory** with broad **biological activity**
- Strong potential **health benefits** (preventative and protective)
- Strong and rapidly developing **Proprietary** technology platform

Market

- **Significant market size** in several disease conditions
- Strong interest from **marketing and distribution partners**

Corporate

- **Management Team** with significant new technology/market and commercialization experience
- Significant **Scientific Resources** and Strong Malaysian government **funding** and supporting policy

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