COCOCIN™: THE NOURISHMENT FACTOR™
FREEZE-DRIED COCONUT WATER SOLIDS

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Introduction

Coconut water is the liquid endosperm of *Cocos nucifera* L used as a supplement in media for the growth of plant tissue cultures. The coconut fruit is unique in that it contains large amounts of this liquid over periods of a year or more in its life cycle. The greatest amount of coconut water is found in young, green coconuts and provides nourishment for the growth of the solid endosperm (coconut meat) inside the hard shell of the fruit. When the fruit matures, both the solid endosperm and the remaining coconut water serve as nutrients for the developing embryo and seedling. Thus coconut water serves as a natural reservoir of nutrients to promote tissue growth

Coconut water as nutrient medium for cell/tissue culture:

The nutritional composition of coconut water obtained from fruits at different stages of maturity has been determined. The medium is rich in proteins, amino acids sugars, vitamins, minerals and growth hormones (Table 1) essential to promote tissue growth. In addition, shikimic acids and quinic acids have been detected in samples of coconut water from fruits at different stages of maturity, with the maximum amounts being found in young green coconuts. The probable role of these alicyclic acids in aromatic biosynthesis, indicates their importance in the developing coconut. They may also play a significant role in the nutrition of plant and tissue cultures.

![Shikimic acid](image1.png)

![Quinic acid](image2.png)
**TABLE 1**
VITAMIN, GROWTH PROMOTERS, SUGAR ALCOHOLS AND MINERAL CONTENTS IN COCONUT WATER

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>Mg/L</th>
<th>Mg/100g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nicotinic acid</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>Pantothenic acid</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>Biotin</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Riboflavin</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Folic acid</td>
<td>0.003</td>
<td></td>
</tr>
<tr>
<td>Thiamine</td>
<td>Trace</td>
<td></td>
</tr>
<tr>
<td>Pyridoxine</td>
<td>Trace</td>
<td></td>
</tr>
<tr>
<td>Auxin</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Gibberellin</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>1,3-Diphenylurea</td>
<td>5.8</td>
<td></td>
</tr>
<tr>
<td>Sorbitol</td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td>M-inositol</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Scyillo-inositol</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Potassium</td>
<td>312.0</td>
<td></td>
</tr>
<tr>
<td>Chloride</td>
<td>183.0</td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>105.0</td>
<td></td>
</tr>
<tr>
<td>Phosphorus</td>
<td>37.0</td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td>30.0</td>
<td></td>
</tr>
<tr>
<td>Sulfur</td>
<td>24.0</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>

* A significant growth response was obtained from dwarf peas with an extract of 188 ml of coconut water.

The RNA-phosphorus (RNA-P) content of coconut water was found to be consistently high at all levels of fruit maturity (Table 2). The ratio RNA-P/DNA-P was unusually high. The role of RNA in amino acid transport and respiratory metabolism of living cells is well known. The RNA of coconut water would therefore effectively carry out these and other functions as part of the metabolic machinery essential to the developing endosperm tissue of the coconut and therefore support the growth of other living cells as well, in tissue culture.
Cytokinins are a class of plant growth substances (plant hormones) active in promoting cell division. They are also involved in cell growth and differentiation and in other physiological processes. A major cytokinin found in coconut milk was isolated using a standard procedure, the tobacco callus growth promoting assay. The structure was determined to be a complex trans-zeatin riboside (G3A2-ZR). The authors of this study attributed at least 20% of the cytokinin activity in coconut milk to this compound.

A study that explored the efficacy of single and combined growth regulator treatments of indole-3-acetic acid (IAA), gibberelic acid (GA3) and coconut milk on plant height, yield, chlorophyll and vitamin contents of plants such as *Abelmoschus esculentus* L and *Solanum gilo* L found that 100 mg/L GA3 and 15% coconut water were significantly effective treatments.

**Cosmeceutical applications**

In view of the role of coconut water solids in supporting cell growth, Cococin™ may be used in applications to support the growth of human tissues such as hair follicles. The product may therefore be used in hair care formulations and in rejuvenative topical preparations. Freeze-drying under controlled conditions ensures that the solids retain optimum biological activity.

Cococin™ was found to be safe for topical use. In laboratory studies, the material was found to have zero skin irritation potential and LD₅₀ values greater than 2000 mg/kg when administered through the skin.
Nutritional applications:

The nutritive properties of coconut water are well known. In the tropics, coconut water is valued as a refreshing beverage. Studies revealed that young coconut water can be used, together with early refeeding, as a home glucose electrolyte oral rehydration solution in the early stages of mild diarrheal disease. The natural enzymes present in coconut water would also support digestion and elimination of toxic wastes. Coconut water solids would also provide a nutritive medium for the beneficial microflora in the gastrointestinal tract. A recent report also mentions the successful use of coconut water as a short-term intravenous hydration fluid.

Coconut water is described as an isotonic sports drink. The comparative properties of coconut water and conventional sports drinks are listed in Table 3:

<table>
<thead>
<tr>
<th>Component</th>
<th>Sports drinks (mg/100 ml)</th>
<th>Coconut water (mg/100 ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>11.7</td>
<td>294</td>
</tr>
<tr>
<td>Sodium</td>
<td>41</td>
<td>25</td>
</tr>
<tr>
<td>Chloride</td>
<td>39</td>
<td>118</td>
</tr>
<tr>
<td>Magnesium</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Sugars</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

TABLE 3
SPORTS DRINKS VS. COCONUT WATER
References


** The liquid endosperm of coconut is often called coconut milk; this use is probably derived from the French term lait de coco. In English, the proper term for the liquid endosperm is coconut water.

Protocols of studies on cosmeceutical products performed /sponsored by Sabinsa Corporation are based on alternatives to animal testing. Any references to animal tests appearing in product informational materials are related to information from published scientific literature compiled therein.
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Company Profile:
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