Soy Protein V Hemp Protein

Barrie Carlsen

Not all vegetable proteins are created equal; in fact soy proteins are the only plant-based proteins with a protein quality equal to that of meat, milk and eggs. This high-quality protein comes in three major forms for maximum flexibility in food applications: soy flours, soy protein concentrates, soy protein isolates. Hemp protein, in spite of the misleading marketing hype, is a poor quality protein when compared to soy, egg, and milk proteins.

Protein Quality: Protein is a macronutrient with many functions. Proteins supply amino acids. Amino acids are the building blocks of protein. They are used for the formation of muscle and other protein-containing components in the body including immunoglobulin, albumin, enzymes and hormones. The body synthesizes non-essential amino acids, while others are essential and must be supplied by food sources. Proteins and other nitrogen-containing compounds are continuously degraded and rebuilt. All of these losses must be replaced by a continuous supply of amino acids, provided through the diet.

All plant and animal proteins have approximately the same 20 amino acids. The proportion of the amino acids varies as a characteristic of the protein source. The nutritional quality of any protein relates to its amino acid composition, digestibility, and ability to supply the essential amino acids in the amounts required by the species consuming the protein. The ability of Soy Proteins to supply the essential amino acids in the amounts required by humans has been examined in several protein quality studies. These studies have involved infants, pre-school children and adults.

Traditionally, Protein Efficiency Ratio (PER) was used to evaluate the quality of proteins. The PER method reflects the amino acid requirements of young growing rats, and not humans. A report was published in 1991, by the Food and Agricultural Organization/World Health Organization (FAO/WHO) Joint Expert Consultation which called for a more acceptable and validated procedure for protein quality evaluation. The recommended method, called Protein Digestibility-Corrected Amino Acid Score (PDCAAS), was adopted by regulatory bodies in most countries including the US Food and Drug Administration (FDA) for protein quality evaluation and nutrition labeling purposes for products intended for children over the age of two and adults.

The PDCAAS method is based on an amino acid scoring method, comparing the amino acid profile of the test protein food to the FAO/WHO two- to five-year-old amino acid pattern. The two- to five-year-old pattern is used because it exceeds the amino acid requirement patterns of older children and adults. The most limiting amino acid is used to determine the uncorrected amino acid score and that number multiplied by the food's digestibility is the PDCAAS. Using this method, Isolated Soy Proteins have the highest obtainable score (1.0) for calculating the corrected protein value. No protein can have a PDCAAS greater than 1.0. Soy Proteins are highly digestible, complete proteins containing all the essential amino acids in the reference pattern in the correct proportion. By contrast, Hemp protein scores very low on the PDCAAS with a value of less than .5 and with 5 essential amino acids below the minimum reference pattern.
The calculated PDCAAS (for soy protein isolate):

**Digestibility** = 97%

**Uncorrected Amino Acid Score** = 26 divided by 25 = 1.04

**Protein Digestibility Corrected Amino Acid Score** = 0.972 x 1.04 = 1.00

The following list shows soy proteins and hemp proteins compared to the FAO/WHO reference pattern for the essential amino acids: Hemp protein is deficient in all of the essential amino acids as compared to the FAO/WHO with tryptophan being the limiting amino acid. Hemp will not meet the minimum protein requirements for 2-5 year olds.

<table>
<thead>
<tr>
<th></th>
<th>Hemp Protein</th>
<th>Soy Protein</th>
<th>FAO/WHO 2-5 Yr Old Pattern</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>mg/g protein</td>
<td>mg/g protein</td>
<td>mg/g protein</td>
</tr>
<tr>
<td>Histidine</td>
<td>5</td>
<td>26</td>
<td>19</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>3</td>
<td>49</td>
<td>28</td>
</tr>
<tr>
<td>Leucine</td>
<td>14.2</td>
<td>82</td>
<td>66</td>
</tr>
<tr>
<td>Lysine</td>
<td>8.6</td>
<td>63</td>
<td>58</td>
</tr>
<tr>
<td>Methionine + Cystine</td>
<td>7.6</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>Phenylalanine + Tyrosine</td>
<td>18.6</td>
<td>90</td>
<td>63</td>
</tr>
<tr>
<td>Threonine</td>
<td>7.4</td>
<td>38</td>
<td>34</td>
</tr>
<tr>
<td>Tryptophan</td>
<td>1.2</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>Valine</td>
<td>6</td>
<td>50</td>
<td>35</td>
</tr>
</tbody>
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**Soy Protein Forms:**

Three Major Processed Soy Products

- **Soy Flours:** are made by grinding de-hulled, defatted soybean flakes. Soy flour is approximately 50 percent protein by weight and contains the carbohydrate components of the soybean sugars, oligosaccharides and fiber.

- **Soy Protein Concentrates:** are made by removing a portion of the carbohydrates from defatted and de-hulled soybeans. Soy protein concentrates retain most of the fiber in the original soybeans and must contain at least 65% protein on a moisture-free basis.

- **Soy Protein Isolates:** are prepared through a process using water extraction and minimum heat on soy flakes. The product is nearly carbohydrate and fat-free, with no characteristic "beanie" flavor. Soy protein isolates prepared this way are 90 percent protein by dry-weight.

**Hemp Protein Forms:**

Most commercially available hemp “protein” products are not pure protein, but claim up to 50% protein and are comparable to Soy Flours. (Natural hemp flour contains 33% protein). There are no commercially available Hemp protein concentrates or Hemp protein isolates.

The following table contains the amino acid profile of hemp protein as published by the Hemp protein manufactures and it is contrasted with the minimum protein requirements of the
FAO/WHO 2-5 year old reference pattern. It can be seen that Hemp is an inferior protein as it does not meet the protein requirements of the 2-5 year old human child.

"Hemp Amino Acid Profile (mg / 30 serving)

(Hemp “protein” is 50% protein)  mg per gram of protein  FAO/WHO

Alanine: 288  (Must divide by 15 to get mg per g)  19.2
*Arginine (children): 564  37.6
Asparatic Acid & Asparagine: 594  39.8
Cysteine: 36  2.4
Cystothionine: 27  1.8
Glutamic Acid & Glutamine: 1044  69.6
Glutamine: 1044  69.6
Glycine: 291  19.4
*Histidine (children): 75  5.0  19
*Isoleucine: 45  3.0  28
*Leucine: 213  14.2  66
*Lysine: 129  8.6  58
*Methionine: 78  5.2
*Phenylalanine: 105  7.0
Phosphoserine: 27  1.8
Proline: 219  14.6
Serine: 258  17.2
*Thrreonine: 111  7.4  34
*Tryptophan: 18  1.2  11
Tyrosine: 174  11.6  35
*Valine: 90  6.0
* Essential Amino Acids"

Methionine + Cysteine: 114  7.6  25
Phenylalanine + Tyrosine: 279  18.6  63

NOTE: Most Hemp protein manufactures try to “hide” the true quality of the protein in Hemp by showing the amino acid profile of the manufactured 50% protein product. Actually Hemp has about 33% protein, not 50% as alluded to.

1. Nutritional Profile and Benefits of Hemp Seed, Nut and Oil by Gero Leson
2. Ancient Harvest Hemp Protein Amino Acids