

Digestible Indispensable Amino Acid Score (DIAAS) better Estimates the Protein Value of American Pistachios than Digestibility Corrected Amino Acid Score (PDCAAS)

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BACKGROUND: Pistachios (*Pistacia Vera*) are nutrient-dense foods with a healthy nutritional profile that contains fiber, unsaturated fatty acids, essential nutrients, phytochemicals and protein. However, the nutritional quality of the protein has not been characterized to date.

OBJECTIVE: Determine the Protein Digestibility Corrected Amino Acid Score (**PDCAAS**) and Digestible Indispensable Amino Acid Score (**DIAAS**) for raw and roasted American pistachio nuts in growing pigs.

RESULTS: The values for apparent ileal digestibility (**AID**) of crude protein (**CP**) and the standardized ileal digestibility (**SID**) were calculated for these proteins. The **CP** content was greater for raw pistachios (27.1%) compared with roasted pistachios (25.1%). The amino acid (**AA**) in greatest concentration for both types of pistachio were arginine followed by leucine. The **AA** in the lowest concentration were tryptophan followed by methionine. The **AID** of **CP** was greater ($P < 0.05$) for raw pistachios than for roasted pistachios, and the **AID** of most indispensable **AA** (**IAA**), except arginine, isoleucine, and phenylalanine, was greater ($P < 0.05$) for raw pistachios. The **SID** of **CP** was greater ($P < 0.05$) for raw than for roasted pistachios, and the **SID** of all **IAA**, except phenylalanine, was greater ($P < 0.05$) for raw than for roasted pistachios. The **PDCAAS** calculated for both types of pistachios was based on the requirements for children from 2 to 5 years old (FAO, 1991), whereas the **DIAAS** was calculated based on the requirement for children 3 years and older, adolescents, and adults (FAO, 2013). Raw and roasted pistachios had a **PDCAAS** of 73 and 81% respectively. In contrast, the **DIAAS** was numerically greater for raw pistachios than for roasted pistachios with values of 86 and 83, respectively (Figure 1). For **PDCAAS**, the first limiting **AA** in both raw and roasted pistachios when compared with the AA requirements for children 2 to 5 years was threonine. For **DIAAS**, lysine was the first limiting **AA** in both raw and roasted pistachios when compared with the **AA** requirements for children 3 years and older, adolescents, and adults (Table 1).

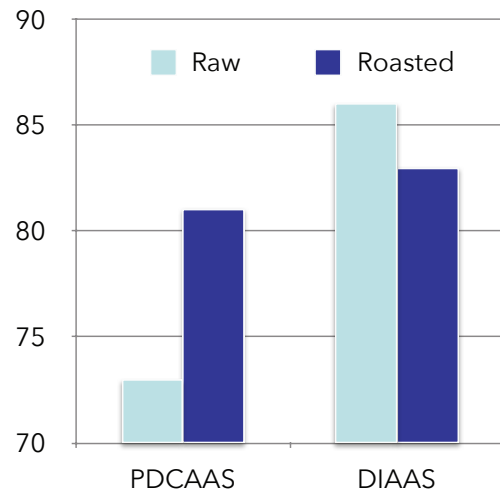


Table 1. PDCAAS and DIAAS Reference Ratios for Raw and Roasted Pistachios*

Amino Acid (AA)	PDCAAS Raw	PDCAAS Roasted	DIAAS Raw	DIAAS Roasted
Histidine	0.95	1.04	1.09	1.07
Isoleucine	1.34	1.48	1.18	1.18
Leucine	0.88	0.96	0.91	0.90
Lysine	0.76	0.81	0.86	0.83
Sulfur AA	1.13	1.24	1.17	1.18
Aromatic AA	1.11	1.21	1.62	1.58
Threonine	0.73	0.81	0.95	0.92
Tryptophan	1.05	0.90	1.75	1.38
Valine	1.40	1.56	1.17	1.16

*PDCAAS were calculated using the recommended AA scoring pattern for preschool children (2 to 5 years); DIAAS values were calculated using the recommended scoring pattern for older child (3 years), adolescent and adult. First limiting amino acid values are in the shaded cells.

Figure 1. PDCAAS and DIAAS for Raw and Roasted Pistachios*



*Values for PDCAAS were calculated from standardized total tract digestibility of crude proteins: 92.11% for raw and 91.64% for roasted pistachios. Crude protein values were calculated using a nitrogen-to-protein conversion factor of 6.25

CONCLUSION: Based on the **DIAAS** cut-off values describing protein quality (FAO, 2013), raw pistachios and roasted pistachios can both be considered a 'Good' quality protein if consumed by children older than 3 years, adolescents, and adults. Roasting pistachios decreased ileal digestibility of **AA** and the **DIAAS** values but this was not reflected in the **PDCAAS**. **DIAAS** may more accurately represent the protein quality in heat treated foods.

References: Food and Agriculture Organization of the United Nations (FAO) Consultation (1991), Protein quality evaluation. <http://www.fao.org/docrep/013/t0501e/t0501e00.pdf>
 Food and Agriculture Organization of the United Nations (FAO) Expert Consultation (2013), Dietary protein quality evaluation in human nutrition. <http://www.fao.org/3/a-i312e.pdf>

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