

**Compilation of free amino acid data for various food raw materials, showing the relative contributions of asparagine, glutamine, aspartic acid and glutamic acid to the free amino acid composition.**

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The data shown in the following Table have been summarised from papers published over the past 30 years. It is not necessarily a complete literature survey, but may provide a useful indication of the types of foods that contain relatively high levels of asparagine and glutamine.

No attempt has been made to review the methodology used or to validate the data.

The papers do not follow the same methods for data calculation and presentation. Some give concentrations on a wet weight basis, others on in relation to the dry weight. Consequently it has not been possible to tabulate concentrations based mass, and the data have all been re-calculated and presented in this Table as a percentages.

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**Table.** Free amino acids in various foods, as a percentage of total free amino acids

<i>reference</i>	Food	asparagine	glutamine	aspartic acid	glutamic acid
NUTS					
16	peanuts		8.0 <sup>a</sup>	2.1	25.5
21	almond	34.4	4.7		
6	pecan	2.3	4.7	19.8	18.6
VEGETABLES					
10	broccoli	6.6	45.8	8.4	14.5
7	green bean	42.9	10.1	4.5	2.1
7	kale	5.5	44.7	2.6	8.3
7	spinach	3.6	28.5	4.5	22.5
7	cauliflower	3.6	9.1	35.7	16.1
7	potato	35.7	30.4	3.2	4.3
15	crisping potato	40.0	12.0	2.0	4.0
17	processed cassava	5.9	1.7	0.9	2.5
12	asparagus				
	fresh	10.2	27.8	5.0	11.2
	stored 20 days at 20 °C	47.3	8.5	4.5	2.4
CEREALS					
20	milled rice	5.6	1.3	19.0	34.8
4	rye				
	normal protein	3.4	11.8	5.9	16.8
	high protein	17.9	17.5	4.6	10.6
22	w heat	22.9	3.2	22.9	15.5
18	malt (60 °C ethanol extraction)	7.3	2.2	6.4	15.6
FRUIT & FRUIT JUICES					
11	blackcurrant	7.5	27.1	1.9	19.6
11	navel orange	22.0	0.0	8.9	3.9
11	lemon	11.0	0.0	24.7	13.0
11	tomato	13.3	0.0	11.6	34.2
11	banana	14.7	18.9	10.6	6.2
11	pineapple	39.0	8.0	9.1	2.8
11	strawberry	56.8	13.9	2.7	7.4
14	cantaloupe	0.8	2.6	22.3	8.7
5	apple juice	62.0	0.3	15.6	3.9
5	grape juice	0.5	0.4	2.3	3.6
5	pineapple juice	40.0	7.3	4.1	4.7
11	perry pear juice	9.0	2.0	10.0	10.0
BEVERAGES					
3	coffee				
	green arabica	11.5		11.5	25.3
	green robusta	12.3		10.7	12.5
2	cocoa powder				
	unroasted	3.7	4.4		
	roasted (135 °C / 3 min)	7.2	6.1		
19	red wine	9.8	0.1	4.5	16.2
MEAT					
9	pork	1.0	27.1	0.3	2.0
1	chicken	4.6	8.0	2.8	10.5
8	beef	1.3		1.1	27.7
MISCELLANEOUS					
13	cheese (Cheddar)	0.0	0.0	1.9	18.5

<sup>a</sup> combined value for glutamine and asparagine.

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