

BARTEK MALIC ACID AND FUMARIC ACID SUGGESTED USAGE CHART

Products	Suggested Usage Levels	
	Malic Acid	Fumaric Acid
Carbonated soft drinks	0.03 - 0.90%	Not used
Non-carbonated beverages	0.15 - 1.00%	0.12 - 0.30%
Powdered beverage mixes	0.50 - 5.00%	0.40 - 3.00%
Hard candy	0.80 - 1.20%	Not used
Sour hard candy	1.00 - 2.00%	Not used
Chewing gum	0.50 - 1.00%	0.10 - 0.60%
“Gummies” (candy with pectin and/or gelatin gel)	1.00 - 3.00%	0.10 - 0.60%
Marmalades, jams	0.05 - 0.35%	0.03 - 0.10%
Gelatin desserts, prepared	0.20 - 0.50%	0.05 - 0.30%
Gelatin dessert mixes	1.20 - 3.00%	0.30 - 1.80%
Corn Flour Tortillas	0.10 - 0.30%	0.10 - 0.30%
Wheat Flour Tortillas	(baker’s percent) Not used	(baker’s percent) 0.10 - 0.20% (baker’s percent)
Baking powder	Not used	10.0 - 20.0%
Snack foods	0.05 - 0.25%	Not used
Frozen desserts	0.10 - 0.5%	Not used
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Nutraceutical Products:	Malic Acid	Fumaric Acid
Herbal drinks	0.15 - 1.00%	0.12 - 0.30%
Nutri-bar and Sports bars	0.05 - 0.35%	0.03 - 0.10%
Vitamin C enriched candy and chewing gum	Use 20% less than recommended ranges, because ascorbic acid contributes some acid flavour.	
Calcium-enriched beverages, candy, and chewing gum	Use 20% more than above recommended ranges, because most calcium salts raise the pH.	

NOTE: The usage ranges outlined in this chart are to be used as suggested starting points for formulators who are developing products. Each region has different taste preferences which must be taken into account. Source: NutriQuim.

ACID REPLACEMENT CHART

Acid	Citric	Adipic	Malic	Tartaric	Phosphoric	Fumaric
Citric	1	0.88	1.10	1.17	1.48	1.23
Adipic	1.13	1	1.18	1.28	1.53	1.33
Malic	0.90	0.75	1	1.05	1.30	1.08
Tartaric	0.85	0.73	0.88	1	1.28	1.03
Phosphoric	0.58	0.50	0.63	0.73	1	0.78
Fumaric	0.78	0.68	0.88	0.93	1.23	1

Source: Hatchwell, Leora C., NSC Technologies. IFT Workshop: Optimizing Food and Beverage Flavors, June 2, 1995, Anaheim, CA.