

Allergen Data Collection:**Mango** (*Mangifera indica*)

Authors in alphabetical order [[contact information](#)]

Matthias BESLER (Hamburg, Germany)
 Angelika PASCHKE (Hamburg, Germany)
 Julia RODRÍGUEZ (Madrid, Spain)

Abstract

Mango is the second most frequently cultivated tropical fruit worldwide. Most popular varieties of mango fruits are Tommy Atkins (South Africa), Osteen (Spain), Eden (Israel), and Ngowe (Kenya). Mango, together with pistachio and cashew, belongs to the Anacardiaceae family. All three foods may cause severe anaphylactic reactions. Immediate type oral symptoms are most frequently seen after ingestion of mango fruits. Besides allergic reactions to the fruits, sensitizations to mango pollen and seeds have been described. The incidence of mango fruit allergy is apparently high in subjects with "celery-mugwort-spice syndrome" or latex and pollen allergy, although this fact has not been established by double-blind, placebo-controlled food challenge (DBPCFC).

Two major mango allergens with 30 and 40 kDa and a 46-kDa-allergen (putative chitinase) have been identified. Cross-reactivities between mango fruit allergens and mugwort pollen, birch pollen, celery, carrot, and apple have been described. Further, latex and avocado allergens cross-react with mango allergens.

The present data collection reviews detailed information on the prevalence and symptoms of mango allergy as well as diagnostic features, sensitization patterns, and the occurrence of cross-reactivities in tabular form.

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	<u>page</u>
<u>1</u> <u>Prevalence of Mango Allergy</u>	136
<u>2</u> <u>Symptoms of Mango Allergy</u>	137
<u>3</u> <u>Diagnostic Features of Mango Allergy</u>	137
<u>4</u> <u>Composition of Mango</u>	138
<u>5</u> <u>Allergens of Mango</u>	138
<u>5.1</u> <u>Sensitization to Mango Allergens</u>	139
<u>6</u> <u>Isolation & Preparation</u>	139
<u>7</u> <u>Cross-Reactivities</u>	139
<u>8</u> <u>Stability of Mango Allergens</u>	140
<u>9</u> <u>Allergenicity of Different Mango Varieties</u>	140
<u>10</u> <u>Allergen Sources</u>	140
<u>11</u> <u>References</u>	140

Disclaimer

The reference lists of the Allergen Data Collections are based mainly on searches of Medline and FSTA (Food Science & Technology Abstracts) databases up to the related dates of publication. The scientific rigor of the studies listed is variable and not subject of critique or evaluation by the authors or the editor of the Allergen Data Collections. The reader should be aware of considerable problems in comparing data from different studies (eg. patient cohorts, diagnostic performances, possible flaws in allergen preparations and methodologies for allergen characterization) and is encouraged to review the original publications.

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1 Prevalence of Mango Allergy

It is difficult to do an estimation of prevalence of mango allergy due to differences in study populations (latex allergy, pollen allergy, food allergy, fruit allergy, etc.), differences in dietary habits, geographical areas, or differences in diagnostic procedures. Prevalence data are based on different diagnostic procedures. While the prevalence of sensitization can be estimated by SPT, RAST, and immunoblot, a clinical relevant sensitization (allergy) is evaluated by convincing history or food challenge tests (ideally by DBPCFC).

1.1 Subjects with Atopic or Other Diseases

Country / Subjects	Allergy / Sensitization	References
France, Paris a) 24 patients with latex and pollen allergy b) 20 patients with latex allergy (no pollen allergy) c) 25 patients with pollen allergy (no latex allergy)	clinical symptoms SPT a) mango in 8% and 50% b) mango in 0% and 20% c) mango in 0% and 44%	Levy et al. 2000
France, Pierre Benite 60 cases of anaphylaxis (study period 1984-92)	mango 6.7%	Andre et al. 1994
Germany 136 latex allergic patients	mango 18% (RAST) mango 2.9% (self-reported)	Brehler et al. 1997
Mexico 71 atopic subjects with asthma and/or allergic rhinitis (age of 14-40 years)	mango pollen 66% (skin test)	Vargas Correa et al. 1991
Switzerland, Zurich 31 patients with "celery-mugwort-spice syndrome"	mango 23% (clinical history)	Wüthrich & Hofer 1984
Switzerland, Zurich 402 food allergic adults (study period 1978-87)	mango 0.7% (clinical history, diagnostic tests)	Wüthrich 1993
Switzerland, Zurich 383 food allergic patients (study period 1990-94)	mango 0.3% (clinical history, diagnostic tests)	Etesamifar & Wüthrich 1998
Thailand, Bangkok 100 patients with allergic rhinitis (age of 10-59 years, mean 28 years)	mango pollen 16% (SPT)	Pumhirun et al. 1997

1.2 Prevalence of Associated Allergies

Country / Subjects	Sensitization / Allergy			References
		RAST	Clinical Symptoms	
<i>Germany, Hamburg</i> 9 mango fruit sensitive patients	mango	100%	56%	Paschke et al. 2001a
	mugwort pollen	100%	100%	
	birch pollen	89%	100%	
	celery	89%	89%	
	carrot	89%	67%	

2 Symptoms of Mango Allergy

Symptoms & Case Reports	References
<p><u>Systemic reactions</u> anaphylaxis (2, 3, 4, 6, 7, 8, 10), collapse (9)</p> <p><u>Symptoms of skin and mucous membranes</u> angioedema (9), generalized itching and hives (5), swelling of face (5), urticaria (9)</p> <p><u>Gastrointestinal symptoms</u> abdominal cramps (5), diarrhea (9, 11, 12), swelling of lips (5, 12), swelling of tongue (5), burning sensation in mouth (5), itching in mouth (10, 11, 12), itching of pharynx (10), itching in throat (11, 12), nausea (5), vomiting (5, 9), in general / not specified (9)</p> <p><u>Respiratory symptoms</u> asthma (1), dyspnea (1, 9, 10), hoarseness (1), rhino-conjunctivitis (10)</p> <p><u>Other symptoms</u> profuse sweating (5)</p> <p><i>Onset of Symptoms</i> Onset of symptoms within a few minutes to 1 h after ingestion (6 mango allergic patients) (1)</p>	<p>(1) Kahn 1942</p> <p>(2) Rubin et al. 1965</p> <p>(3) Dang & Bell 1967</p> <p>(4) Miell et al. 1988</p> <p>(5) Jansen et al. 1992</p> <p>(6) Armentia et al. 1994</p> <p>(7) Kivity et al. 1994</p> <p>(8) Goritsa et al. 1998</p> <p>(9) Henzgen et al. 1998</p> <p>(10) Duque et al. 1999</p> <p>(11) Paschke et al. 2001a</p> <p>(12) Paschke et al. 2001b</p>
	(1) Henzgen et al. 1998

3 Diagnostic Features of Mango Allergy

Parameters / Subjects	Outcome	References
<i>Gender of Patients</i> 52 mango sensitive patients (18 to 63 years of age)	52% of patients were male	Paschke et al. 2001b
<i>IgE and Clinical Relevance</i> 4 latex allergic patients with self-reported mango intolerance	Mango specific IgE (RAST): Sensitivity 0.0% Specificity 82%	Brehler et al. 1997
<i>IgE and Clinical Relevance</i> 9 patients with specific serum IgE against mango and birch pollen, mugwort pollen, celery, and carrot	5 patients had clinical symptoms after ingestion of mango; 1 patient showed no symptoms and 3 patients had never eaten mango	Paschke et al. 2001a
<i>SPT, IgE, Immunoblotting</i> 6 mango and mugwort pollen allergic patients (all female, age of 22-48 years)	All patients were positive in prick-to-prick test with fresh fruits; specific IgE was detectable in only 1 serum by RAST and in 2 sera by SDS-PAGE/immunoblotting	Henzgen et al. 1998

4 Composition of Mango

4.1 Distribution of Nutrients (fresh fruit)

For other mango products see: [USDA Nutrient Database](#)

Nutrients: Content per 100 g		
Energy 247 kJ (58 kcal) Water 82.0 g Protein 0.6 g Lipid 0.5 g Carbohydrate 12.5 g Organic acids 0.4 g Fiber 1.7 g Minerals 0.5 g Minerals Sodium 5 mg Potassium 190 mg Magnesium 18 mg Calcium 12 mg Manganese 25 µg Iron 400 µg Copper 120 µg Zinc 20 µg Phosphorus 13 mg Iodine 2 µg	Vitamins Carotin 3 mg Vitamin E 1 mg Vitamin B1 45 µg Vitamin B2 50 µg Nicotinamide 700 µg Folic acid 40 µg Vitamin C 40 mg	Carbohydrates Glucose 850 mg Fructose 2600 mg Sucrose 9000 mg Lipids Palmitic acid 85 mg Stearic acid 5 mg Oleic acid 85 mg Linolic acid 9 mg Linoleic acid 65 mg Others Malic acid 75 mg Citric acid 295 mg Oxalic acid 35 mg Tartaric acid 80 mg Salicylic acid 110 µg

Reference: Deutsche Forschungsanstalt für Lebensmittelchemie, Garching bei München (ed), **Der kleine "Souci-Fachmann-Kraut" Lebensmitteltabelle für die Praxis**, WVG, Stuttgart 1991

5 Allergens of Mango

Proteins / Glycoproteins	Allergen Nomenclature	References
40-kDa Allergen [pI 4.6 and 4.8]	Man i 1 *	Paschke et al. 2001b
30-kDa Allergen [pI 4.9]	Man i 2 *	Paschke et al. 2001b
46 kDa Allergen (Putative chitinase)		Diaz-Perales et al. 1999
Allergens: 15 kDa (double band), and 38 kDa		Goritsa et al. 1998
Allergens: 15, 45, and 94 kDa		Henzgen et al. 1998
Allergens: 14, 30, 40, 43, and 67 kDa		Kinder et al. 1999, Paschke et al. 2001a

* proposed name not yet listed in WHO/IUIS Allergen Nomenclature

5.1 Sensitization to Mango Allergens

Country / Subjects	Sensitization to		References
<i>Germany, Hamburg</i> 52 mango fruit sensitive patients	Allergen		Paschke et al. 2001b
	67 kDa	in 40%	
	50 kDa	in 23%	
	43 kDa	in 33%	
	40 kDa	in 88%	
	30 kDa	in 88%	
	25 kDa	in 12%	
	16 kDa	in 12%	
	14 kDa	in 15%	
	(SDS-PAGE / immunoblot)		

6 Isolation & Preparation

Extract / Purified Allergens	Methods	References
Protein extract	Fresh fruit homogenized in acetone (-40°C), precipitates washed, filtered, lyophilized and water extracted	Paschke et al. 2001b (described by Möller et al. 1997a)

7 Cross-Reactivities

Cross-Reacting Allergens	Subjects / Methods	References
<i>Mango: (fruits, vegetables, pollen)</i> apple, celery, and birch and mugwort pollen	Inhibition of IgE binding to 15 kDa mango allergen by apple, celery, and pollen extracts (immunoblot inhibition, 1 patient)	Henzgen et al. 1998
<i>Mango: (vegetables, pollen)</i> mugwort pollen, birch pollen, Bet v 1, celery, and carrot	<p><u>EAST inhibition</u> Inhibition of IgE binding to mango extract by carrot (maximum inhibition 80%), celery, birch pollen, mugwort pollen (all approximately 50-60%), and Bet v 1 (28%); IgE binding to celery, carrot, and mugwort pollen by mango extract was 83%, 73%, and 58% maximum inhibition, respectively</p> <p><u>Immunoblot inhibition</u> Carrot and mugwort pollen extracts inhibited IgE binding to 40-, 43-, and 67-kDa-allergens from mango; celery and birch pollen extracts additionally inhibited IgE binding to 14-kDa-allergen from mango; Bet v 1 inhibited exclusively the 14-kDa-allergen; Mango extract inhibited IgE binding to mugwort pollen allergens with 60 kDa (Art v 2) and 70 kDa, to celery allergens with 14 and 16 kDa, to carrot allergens with 40, 45, 50, and 67 kDa and to Dau c 1 (pooled serum from 9 mango sensitive patients)</p>	Paschke et al. 2001a

Mango (46 kDa allergen): (fruits) avocado allergen (Prs a 1, chitinase class I), latex extract	Pooled serum from latex- fruit allergic patients: Inhibition of IgE- binding to 46-kDa mango allergen by Prs a 1 from avocado and by latex extract (immunoblot inhibition)	Diaz-Perales et al. 1999
Mango: (pollen) birch pollen allergen 35 kDa	3 Sera from birch pollen allergic patients reactive to 35 kDa allergen: 79% to 97% inhibition of IgE binding to mango extract by birch pollen extract, 69% to 93% by 35 kDa birch allergen, and no inhibition (<15%) by Bet v 1 from birch pollen (EAST inhibition)	Wellhausen et al. 1996
Mango: (latex) latex	a) 4 and b) 5 latex allergic patients with mango sensitivity: a) 100% inhibition of IgE binding to mango allergens by latex extract; b) 9.4-46% inhibition (mean 31%) of IgE binding to latex extract by mango allergens (RAST inhibition)	Brehler et al. 1997
Mango Seed: (nuts) pistachio	2 patients with pistachio allergy: significant inhibition of IgE binding to pistachio extract by mango seed, no significant inhibition by mango pulp (RAST inhibition)	Fernandez et al. 1995

8 Stability of Mango Allergens and Food Processing

Treatment / Ripening	Effects	References
Mango (Ripening) storage of fruits for 5, 12, 21, 35, and 40 days after harvesting	No significant differences in allergenic potencies of mango fruits of different maturities (EAST inhibition, immunoblot inhibition)	Paschke et al. 2001b

9 Allergenicity of Different Mango Varieties

Varieties / Subjects	Differences	References
4 Mango Strains Mango strains: Eden, Ngowe, Osteen and Tommy Atkins; 7 mango sensitive patients	No significant differences in allergenic potency among the 4 mango strains (EAST inhibition, immunoblot inhibition)	Kinder et al. 1999

10 Allergen Sources

Reported Adverse Reactions	References
Food / Food additives After ingestion of fresh fruits (1)	(1) see 2 Symptoms of Mango Allergy

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