

# Australian Papaya: 2020 Nutrition Review



PREPARED BY CAITLIN REID APD  
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# Introduction

Papaya boats, papaya salsa, papaya curry, papaya popsicles – there are just so many ways to enjoy this unique tropical fruit. Australian grown papaya is available all year round, making it the perfect addition to your favourite recipe regardless of the season. Packed with healthy goodness, papaya is a delicious everyday food for people of all ages.

Red papaya is a pear-shaped tropical fruit with green/yellow skin, bright orange to red flesh, a smooth texture and sweet flavour. Yellow papaw is rounder than papaya, with yellow/orange skin, bright yellow/orange flesh and a less sweet flavour. In this report, papaya, papaw and *Carica papaya* are referred to as papaya as they are considered the same nutritionally.

Papaya contains a unique bundle of vitamins, minerals and antioxidant carotenoids. A single 150g serve of papaya contains double your daily vitamin C requirements (225%), almost a third of vitamin A needs (30%), and more than a quarter of daily folate needs (28%). Papaya also contains fibre and potassium, is low in energy, low fat and has a moderate GI.

Enjoyed as a snack or as an ingredient in your favourite meal, papaya has an array of nutrients that play a role in keeping the gut and eyes healthy, immune system firing and the skin glowing. The folate it contains assists with normal cell division and growth during pregnancy, while the vitamin A and C found in papaya are important for growth and development in kids.

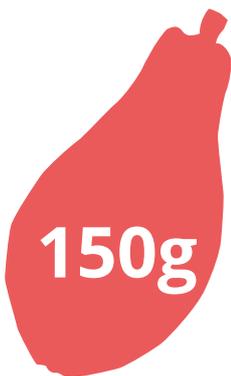
Papaya's delicious taste and versatility make it an appealing fruit suitable for use in multiple dishes over the week. Its soft and mushy texture also make it perfect for teething babies.

Papaya pairs beautifully with seafood, coconut, passionfruit and lime. My favourite way to enjoy papaya is as a boat for breakfast, while my kids love to snack on it with a squeeze of lime. Added to a curry or served with pork are also some of the many other delicious ways to enjoy papaya.

**By Caitlin Reid APD**

\* This report builds on the findings from the Australian Papaya Health Review 2018

# What is a Serve?

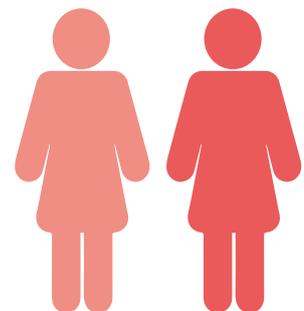


The Australian Dietary Guidelines recommend Australians eat a minimum of two serves of fruit a day. A standard serve of fruit is 150g, which is equivalent to one medium piece of fruit, two small pieces of fruit or a cup of diced fruit.<sup>2</sup>

Unfortunately, half of Australians (51%) do not eat enough fruit.<sup>3</sup>

A standard serving size (150g) of papaya translates to around a third of an average papaya – making it a perfect choice to share or enjoy over a few days.

One in two (51%) Australians do not eat enough fruit.<sup>3</sup>



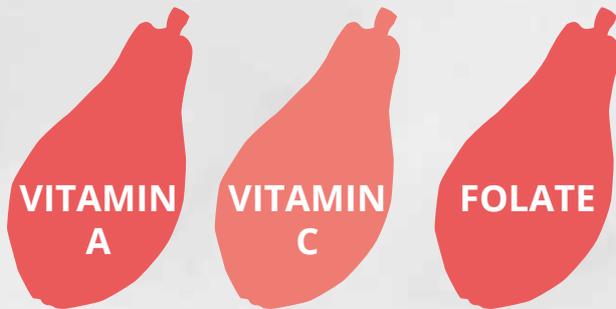


Australian grown papaya is available all year round, making it the perfect addition to your favourite recipe regardless of the season.

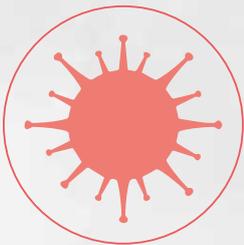
# The Facts on Papaya

From digestive and immune wellbeing to skin hydration and elasticity, papaya is loaded with delicious goodness.

For the average Australian, a serve of papaya (150g) provides all their vitamin C needs, almost a third of vitamin A needs, and more than a quarter of folate needs.



## 5 GOOD REASONS TO EAT PAPAYA



**BOOST YOUR  
IMMUNITY**



**GLOWING  
SKIN**



**GOOD MOOD  
FOOD**



**GOOD GUT  
HEALTH**



**FEEL FULLER  
FOR LONGER**



To pick a perfect papaya, give your papaya a gentle squeeze under the stem. If it's ripe, it will give slightly. If it's a bit hard, ripen your papaya in the fruit bowl then store it in the fridge.

## SIMPLE SNACK



Use papaya in both sweet and savoury dishes. They pair well with coconut, passionfruit, seafood, curries and pork. Squeeze fresh lime on top for a fresh snack.



# Nutrient Summary

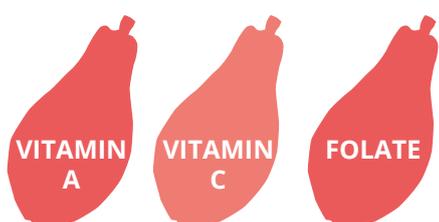
## PAPAYA NUTRIENT INFORMATION<sup>4-5</sup>

Nutrient	Per serve (150g)	Per 100g	RDI/DI <sup>6-7</sup>	% RDIs/DI for average adult	Nutrition content claim <sup>8-9</sup>
Energy (kJ)	213	142	8700	2.4%	Low in energy
Water (g)	134	89.3	N/A	N/A	High in water
Protein (g)	0.6	0.4	50	1.2%	
Fat, total (g)	0.2	0.1	70	0.3%	Fat free
Saturated fat (g)	0	0	24	0%	Saturated-fat free
Cholesterol (mg)	0	0	N/A	N/A	Cholesterol free
Carbohydrates, total (g)	10.4	6.9	310	3.4%	
Sugars (g)	10.4	6.9	90	11.6%	
Dietary fibre (g)	3.5	2.3	30	12%	Source of fibre
<b>Vitamins</b>					
Vitamin A Eq (µg)	228	152	750	30%	Good source of vitamin A or High in vitamin A
Vitamin C (mg)	90	60	40	225%	Good source of vitamin C or High in vitamin C
Folate (µg)	56	37	200	28%	Good source of folate or High in folate
<b>Minerals</b>					
Sodium (mg)	11	7	2300	0.5%	Low in sodium
Potassium (mg)	210	140	N/A	N/A	Contains potassium
Magnesium (mg)	21	14	320	6.5%	No claim
<b>Carotenoids</b>					
Beta-carotene (µg)	360	240	N/A	N/A	Presence of beta-carotene
Cryptoxanthin (µg)	2025	1350	N/A	N/A	Presence of cryptoxanthin
Lycopene (µg)	2742*	1828*	N/A	N/A	Presence of lycopene NB: This claim is for red papaya only, as yellow flesh doesn't contain lycopene (0ug)
Lutein/Zeaxanthin (µg)	134*	89*	N/A	N/A	Presence of lutein/zeaxanthin

#Australian Food Composition Database<sup>4</sup>

\*USDA<sup>5</sup>

# Nutrition Profile



Papaya packs a nutrition punch. For the average Australian, a 150g serve of papaya provides all their vitamin C needs, almost a third of Vitamin A needs and more than a quarter of daily folate requirements. Papaya also contains a unique combination of antioxidant carotenoids, which help keep the immune system healthy and fight free radical damage.

**Vitamin A:** A 150g serve of papaya contains almost a third of an adult's daily vitamin A needs (30% of the RDI). Vitamin A is a fat-soluble vitamin which helps maintain normal reproduction, good vision and eye health, a strong immune system as well as healthy skin and mucous membranes.<sup>10</sup> In kids, vitamin A is needed for normal growth and development.

**Vitamin C:** A 150g serve of papaya contains more than twice an adult's daily vitamin C requirements (225% of RDI). Vitamin C is a water-soluble vitamin and an antioxidant. It helps with the absorption of iron in the body and also plays an important role in growth and repair in all parts of the body. This includes the skin, cartilage, tendons, ligaments and blood vessels, as well as maintaining bones and teeth.<sup>10</sup> As an antioxidant, vitamin C blocks some of the damage caused by free radicals.

**Folate:** A serve of papaya contains more than a quarter of an adult's daily folate requirements (28% of the RDI). Folate is a water-soluble vitamin that plays an important role in helping the body form red blood cells. It is important for proper brain function and aids in the production of genetic material. Folate also works closely with vitamin B12 to help make red blood cells.<sup>10</sup>

The beneficial effects of adequate folate before conception are well established, with folate supporting conception and the development of a healthy placenta. Adequate folate is also vital for bub, with research showing it reduces the risk of neural tube defects such as spina bifida.<sup>11</sup>

**Carbohydrates:** A serve of papaya provides carbohydrates, which are vital energy for the body and brain.<sup>12</sup> Carbohydrates also play an important role in the structure and function of our cells, tissues and organs. Papaya has a moderate glycaemic index and a low glycaemic load.<sup>13</sup>

**Fibre:** Papaya is a source of fibre, with a single serve contributing to almost 12% of our daily needs. Fibre is important for maintaining digestive health, regular laxation, reducing blood cholesterol and modulating blood glucose levels. It has also been related to a reduced risk of a number of chronic diseases including heart disease, certain cancers and diabetes.<sup>14</sup>

**Potassium:** Papaya contains the mineral potassium. Potassium is vital for the normal functioning of all cells. It regulates the heart, keeps muscles and nerves functioning normally and is essential for maintaining electrolyte balance in the body.<sup>10</sup>

**Antioxidant Carotenoids:** Papaya provides a unique combination of antioxidant carotenoids. Carotenoids are plant molecules responsible for bright red, yellow and orange pigments in many fruits and vegetables and are thought to play an important role in maintaining health. A combination of carotenoids appears to work together to provide a greater effect than when they are consumed alone.<sup>15</sup>

The carotenoids found in papaya include:

**Beta-carotene:** Beta-carotene is a pigment that gives papaya its yellowish orange colour. Beta-carotene is an antioxidant that protects the body from the damaging effects of free radicals. In the body, beta-carotene converts to vitamin A (retinol). We need vitamin A for normal reproduction, good vision and eye health, a strong immune system and healthy skin and mucous membranes.

**Cryptoxanthin:** Like beta-carotene, cryptoxanthin is a precursor for vitamin A and also acts as an antioxidant. Research suggests that cryptoxanthin is more bioavailable from common food sources such as papaya than beta-carotene.<sup>16</sup>

**Lycopene:** Lycopene gives red papaya its colour. It is not found in yellow-flesh papaya (aka papaw). Like beta-carotene and cryptoxanthin, lycopene acts as an antioxidant. As lycopene is fat-soluble, consuming it with fat – like with avocado in a Buddha bowl or regular Greek yoghurt in a papaya boat – increases its bioavailability.<sup>17</sup>

**Lutein and Zeaxanthin:** Lutein and zeaxanthin also have antioxidant properties. While the levels in papaya are not as high as those found in parsley, spinach, kale and egg yolks, it appears the bioavailability of lutein and zeaxanthin is stronger from fruits than it is from vegetable sources. Studies suggest that almost 100% of the lutein, zeaxanthin (and cryptoxanthin) is absorbed from fruits whereas between 19% and 38% is absorbed from spinach and broccoli respectively.<sup>18</sup>

## WHAT ARE FREE RADICALS?

Free radicals are unstable molecules that are generated either from normal essential metabolic processes in the body or from external sources such as exposure to x-rays, the ozone, cigarette smoking, poor diet, stress, air pollutants and industrial chemicals. An imbalance between free radical production and antioxidant defences leads to long-term damage including premature ageing and poor health.<sup>19</sup> Free radicals may contribute to ageing and the development of conditions such as heart disease and cancer.<sup>10</sup>

## A HEALTHY GLOW

Looking for a natural glow? Papaya contains a unique bundle of skin protective goodies such as antioxidants, vitamin C, carotenoids and water to help skin glow from the inside out.

Carotenoids, particularly beta-carotene, accumulate in all layers of the skin and contribute to skin colouration to provide a natural glow. Research shows carotenoid skin colouration is perceived by young adults to be healthier and more attractive than tanning.<sup>20</sup>

According to Australian research published in 2018, women aged between 18-40 years who reported a higher intake of eight specific fruits and vegetables, as well as a higher total fruit intake, showed a higher level of the desirable characteristic of skin yellowness.<sup>21</sup>

These findings support two earlier studies that also found carotenoid-rich fruit consumption improved skin colour. In one study of 81 students from the University of Nottingham Malaysian campus, consumption of a carotenoid-rich smoothie changed skin colour. Carotenoid-rich fruit smoothies may be a useful way to help people not only increase their daily fruit and vegetable consumption, but also provide benefits to appearance.<sup>22</sup>

In the other study published in the Journal of the Academy of Nutrition and Dietetics, researchers found skin colour (defined as yellowness) and fasting blood carotenoid concentrations were significantly higher in women following a high carotenoid fruit and vegetable diet compared to a diet with low-carotenoid fruits and vegetables over a four-week period.<sup>20</sup>

Papaya's high vitamin C content helps with collagen production thereby providing the skin with support and elasticity,<sup>23</sup> while vitamin A plays a key role in the formation and repair of skin cells.<sup>10</sup> Containing nearly 90% water, papaya can also help keep your skin hydrated and glowing.

## IMMUNE BOOST

Papaya contains a unique combination of antioxidants including vitamin A, vitamin C, lutein, zeaxanthin, cryptoxanthin and beta-carotene. These antioxidants improve the gut microbiome and help fight the damaging effects of free radicals in the body, support the immune system, lower oxidative stress and reduce inflammation, all of which promote better health.

Research shows that the typical Western diet characterised by a diet high in sugar, trans and saturated fat and low intakes of complex carbohydrates, fibre, micronutrients and other bioactive molecules like carotenoids and omega-3 fatty acids, increases inflammation in the body and is a risk factor for chronic disease.<sup>28-29</sup>

In contrast, the Mediterranean diet which is rich in fruits, vegetables, nuts, legumes, fish and healthy dietary fats, has been found to reduce the risk of poor health. This is thanks to the protective benefits of the bioactive compounds found in fruits and vegetables and their ability to lower inflammation and support the immune system.<sup>30-31</sup>



## GUT HEALTH

Papaya is a source of fibre, with one serve containing 12% of the daily target for adults. It also has a high water content. Both fibre and water are important for keeping the digestive tract healthy and the bowels regular.

Papaya contains soluble and insoluble fibres, both of which are essential for healthy gut function.

Soluble fibres attract water and form a gel-like mass, which helps slow down digestion. They are generally fermented by bacteria in the lower intestine and form short-chain fatty acids such as butyrate, acetate and propionate, which act as an energy source for cells in the colon, helping to maintain gut health. They also act like a prebiotic and promote the growth of healthy bacteria in the gut,<sup>24-25</sup> thereby helping to improve overall health and wellbeing. Soluble fibre also helps lower cholesterol levels<sup>26</sup> and stabilise blood sugar levels.<sup>27</sup>

In contrast, insoluble fibres reach the bowel undigested and play an important role in normalising large bowel function and preventing constipation.<sup>24</sup> Insoluble fibre bulks up stools and speeds up the removal of waste through the gut making it easier to pass. They also control and balance the pH (acidity) in the bowel, keeping the gut healthy.<sup>25</sup>



## GOOD MOOD FOOD

Diet as a whole has a large impact on mood and mental health. According to a growing body of research, a diet rich in vegetables, fruits such as papaya and fish is associated with a reduced risk of depression, while a diet with added sugar, soft drink and junk food is associated with an increased risk of depression.<sup>32-35</sup>

A diet consisting of a variety of wholefoods not only provides the brain with essential nutrients like omega-3 fats, B vitamins and magnesium, it also provides fibre to keep the gut healthy and antioxidants to reduce inflammation, both of which keep the immune system firing. Healthy gut bacteria are also important for brain function, making a healthy gut important for mental health too.

Conversely, eating large amounts of nutrient-poor, processed foods that are high in fat and sugar negatively impacts neurotrophins, important brain proteins that promote new brain cell growth and protect the brain from oxidative stress.<sup>36</sup>

This Westernised-style diet is also low in fibre and contains food additives like artificial sweeteners and emulsifiers that have been found to alter gut microbiota and damage the intestinal barrier leading to inflammation.<sup>37-38</sup> Growing evidence suggests that gut microbial imbalance can negatively influence nerve cell function and mood.<sup>39</sup>



## TAKE HOME POINTS

- Papaya provides a unique bundle of antioxidants – vitamin A, C and carotenoids – that assist with skin elasticity and the formation and repair of skin cells. All of which are essential for glowing skin.
- Papaya contains water and fibre which are important for maintaining regular bowels.
- Papaya contains a combination of antioxidants which fight the damaging effects of free radicals, reduce inflammation in the body and support immune health.
- Including more fruit like papaya and vegetables in the diet promotes a better balance of gut microbiome, which plays a role in improving mood.
- Enjoy your papaya in multiple dishes or as a snack throughout the week. Start the day with a papaya boat or a smoothie, slice papaya through your salad at lunch and use mashed papaya to make a delicious curry.

# Seniors

## EYE HEALTH

Some of the most important carotenoids for human health include beta-carotene, lycopene, lutein, zeaxanthin and cryptoxanthin – all of which are found in papaya.

Lutein and zeaxanthin are two fat-soluble antioxidants that accumulate in the macula region of the retina which is responsible for fine-feature vision.<sup>43</sup> Research shows that lutein and zeaxanthin are important dietary carotenoids in preventing and reducing cataracts and age-related macular degeneration.<sup>44-45</sup>

Beta-carotene and beta-cryptoxanthin found in papaya are converted in the body into vitamin A, which is important for normal vision and good eye health.

## NUTRIENT BOOST

Papaya delivers a nutrient boost. The good news for papaya lovers is, it appears that the carotenoids in papaya are more bioavailable than from other carotenoid rich foods, including tomatoes and carrots.

An intervention study published in the British Journal of Nutrition randomly assigned people to eat meals containing carrots, tomatoes and papayas, each of which supplied equal amounts of beta-carotene and lycopene.<sup>46</sup>

The bioavailability of beta-carotene from papayas was approximately three times higher than that from carrots and tomatoes, while lycopene was approximately 2.6 times more bioavailable from papayas than from tomatoes.

In addition, the bioavailability of beta-cryptoxanthin from papaya was shown to be 2.9 and 2.3 times higher than that of the other papaya carotenoids beta-carotene and lycopene, respectively. Despite being a small study (n=16), this research provides evidence that papaya represents a valuable source of carotenoids.

A diet rich in antioxidant carotenoids helps keep the immune system healthy and fight the damaging effects of free radicals.

## HEART HEALTH

Diets containing high intakes of fruits like papaya, and vegetables are associated with better heart health and a reduced risk of coronary heart disease. A number of prospective cohort studies have looked at the relationship between fruit and vegetable consumption and its protective role against cardiovascular disease.<sup>47</sup>

The 2001 Physicians' Health study found an inverse association between vegetables rich in carotenoids and risk of coronary artery disease in men,<sup>48</sup> while the pooled analysis from the Nurses' Health Study and Health Professionals' Follow-up Study also found an inverse association between fruit and vegetables and coronary artery disease and stroke in both men and women.<sup>49</sup>

Papaya is also saturated fat free and low in sodium. Diets low in saturated fats reduce total blood cholesterol levels while low salt diets help reduce blood pressure levels. Both keep the heart healthy.<sup>9</sup>





- Papaya contains the carotenoids lutein and zeaxanthin which are important for maintaining vision and eye health.
- Papaya contains vitamin A as well as beta-carotene and beta-cryptoxanthin, which are converted to vitamin A in the body. Vitamin A is important for normal vision and good eye health.
- Papaya delivers a nutrient boost. The beta-carotene and lycopene in papaya is three times more bioavailable than they are from carrots and tomatoes. Antioxidant carotenoids found in papaya fights the damaging effects of free radicals and help keep the immune system healthy.
- Diets containing high intakes of fruits like papaya and vegetables are associated with better heart health and reduce the risk of coronary heart disease.
- Papaya is saturated fat free and low in sodium. Diets low in salt and saturated fat reduce blood pressure and total cholesterol respectively.

# Families

## PREGNANCY

Before, during and after pregnancy, papaya's essential nutrients and antioxidants can provide mums with important nutrients for the growth and development of their bubs. A mother's diet quality can change the development of their offspring in ways that can influence the child throughout their lifetime.<sup>40</sup>

Papaya is high in both folate and vitamin A, two nutrients that are essential to the healthy development of babies in early pregnancy.

Folate is important in pre-conception and throughout pregnancy. Studies have found that folic acid supplementation can prevent more than half of neural tube defects such as spina bifida and anencephaly.<sup>41</sup>

Additional vitamin A is required throughout pregnancy for both the growing baby and the mother. Papaya not only provides vitamin A, but also carotenoids such as beta-carotene and cryptoxanthin that converts to vitamin A in the body.

The antioxidants in papaya are likely to be operating in other beneficial ways for maternal and child health that research is only just discovering. Research published in

2018 found that powerful antioxidant-pyrroloquinoline quinone (PQQ) found in papaya can halt or prevent the progression of fatty liver disease in offspring of mice fed a high-fat Western-style diet. This concept is particularly interesting considering the growing body of evidence suggesting that childhood health is influenced by maternal diet and the infant's microbiome.<sup>42</sup>

## KID'S HEALTH

Papaya is a source of fibre with one serve containing up to 25% of the target for children. Just like for adults, fibre is important for promoting regular laxation in kids.

Papaya also contains folate, vitamin C, vitamin A and potassium, all of which are important for normal growth and development in children. Vitamin A and vitamin C are also important for healthy immune system function and reducing tiredness and fatigue.

When introducing solids, papaya can be easily blended to make a puree. The soft and mushy texture of papaya make it a perfect choice for teething babies. For older children, papaya can be enjoyed in smoothies, to top cereal or as a snack with a squeeze of lime.

- Papaya is a great choice for mums-to-be because it contains more than a quarter of an adult's daily folate requirements, which is essential for normal cell division and growth in pregnancy.
- Being nutrient-rich, low in energy, low in fat and having a moderate GI, papaya is a good choice during pregnancy to satisfy hunger.
- Papaya is a nutrient-rich option for kids of all ages. Fibre will keep them regular, while vitamin C and vitamin A are important for maintaining a healthy immune system and reducing feelings of fatigue.
- The soft and mushy texture of papaya makes it a perfect choice for teething babies.

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