

Australian Papaya

2023 Nutrition Report



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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.

Introduction

What's not to love about papaya - it's available all year round, packed with essential nutrients and tastes delicious! There are so many ways you can enjoy papaya, as this tropical fruit is extremely versatile and can be enjoyed in both savoury and sweet dishes.

Red papaya is a pear-shaped tropical fruit with a green/yellow skin, bright orange/red flesh and a sweet flavour. Yellow papaw is rounder and larger than papaya, has pale orange skin, bright yellow/orange flesh and a less sweet flavour. In this report, papaya and papaw are referred to as papaya as they are considered the same nutritionally, with the exception of lycopene, which is only found in papaya.

Papaya makes it easy to deliver a bundle of essential nutrients to your busy household - all in a colourful, convenient and juicy package! This tropical fruit contains a unique bundle of vitamins, minerals, fibre and antioxidant carotenoids. Research shows including more fruit like papaya and vegetables in the diet boosts immune function, keeps the heart healthy, improves gut microbiota and boosts mood.

The Australian Dietary Guidelines recommend Australians eat a minimum of two serves of fruit each day. A standard serve of fruit is 150g, which is equivalent to around a third of an average papaya.

A serve of papaya contains double your daily vitamin C requirements, almost a third of vitamin A needs, and more than a quarter of daily folate needs.

The carotenoids found in papaya show antioxidant and anti-inflammatory effects, reducing the production of both free radical and reactive oxygen species thereby minimising cell damage and helping to keep the body fit and healthy. Papaya also contains fibre and potassium, is low in energy, low fat and has a moderate GI, making it a nutritious addition to your shopping trolley.

Papaya boats, papaya salsa, papaya curry, papaya popsicles - there are just so many ways to enjoy this unique tropical fruit. Papaya pairs beautifully with seafood, coconut, passionfruit, pork, chicken and lime. One of my go-to snacks is simply fresh papaya with a squeeze of lime juice on top. Packed with inspired goodness, papaya is a delicious everyday food for you and the rest of your household.

By Caitlin Reid, Accredited Practising Dietitian.



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Full of the good stuff

What's in a Papaya?



More than half of Australians (55.2%) do not eat the recommended 2 or more serves of fruit per day.³

A standard serving size of papaya is 150g or about a third of an average papaya.²

Nutrition Summary: Papaya Nutrient Information⁴⁻⁵

Nutrient	Per serve (150g)	Per 100g [#]	RDI/DI ⁶⁻⁷	%RDIs for average adult	Nutrition content claim ⁸⁻⁹
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)	3.4	2.3	30	11.3%	Source of fibre
Vitamins					
Vitamin A Eq (µg)	228	152	750	30%	High in vitamin A
Vitamin C (mg)	90	60	40	225%	High in vitamin C
Folate (µg)	56	37	200	28%	High in folate
Minerals					
Sodium (mg)	10	7	2300	0.4%	Low in sodium
Potassium (mg)	210	140	N/A	N/A	Contains potassium
Magnesium (mg)	21	14	320	6.5%	
Carotenoids					
Beta-carotene (µg)	360	240	N/A	N/A	Contains beta-carotene
Cryptoxanthin (µg)	2025	1350	N/A	N/A	Contains cryptoxanthin
Lycopene (µg)	2742*	1828*	N/A	N/A	Contains 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	Contains lutein/zeaxanthin

[#]Australian Food Composition Database⁴

* USDA⁵

For the complete nutrition information for papaya, see Appendix A.

Appendices B and C show the permitted general level health claims and the permitted high-level health claims for papaya, respectively. These claims are used throughout the report.

Nutrition Profile

Papaya packs a nutrient punch. A 150g serve of papaya provides an Australian adult with their entire daily vitamin C needs, almost a third of daily vitamin A requirements and more than a quarter of daily folate needs⁴. Papaya also contains a unique combination of carotenoids, which show antioxidant and anti-inflammatory effects, reducing free radical production and protecting the body against a range of abnormalities associated with chronic disease¹⁰.

Vitamin A

A 150g serve of papaya contains almost a third of an adult's daily vitamin A needs, or 30% of the Recommended Dietary Intake (RDI). Vitamin A is a fat-soluble vitamin which helps maintain normal reproduction, good vision and eye health, a strong immune system and healthy skin and mucous membranes¹¹.

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 plays an important role in the growth and repair in all parts of the body, including skin, cartilage, tendons, ligaments and blood vessels, as well as maintaining bones and teeth¹¹. As an antioxidant, vitamin C blocks some of the damage caused by free radicals.

Folate

A 150g 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, is important for proper brain function and aids in the production of genetic material. It also works closely with vitamin B12 to help make red blood cells¹¹.

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 babies in utero with research showing it reduces the risk of neural tube defects such as spina bifida¹².

Carbohydrates

A 150g serve of papaya provides 10g of carbohydrates, which is vital energy for the body and brain¹³. 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, making it a suitable choice for many¹⁴.

Fibre

Papaya is a source of fibre, with a serve contributing to 11% of daily needs. Fibre is important for maintaining digestive health, regular laxation, modulating blood glucose and cholesterol levels, and has also been related to a reduced risk of chronic diseases including heart disease, certain cancers and diabetes¹⁵.

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 body¹¹.

Antioxidant Carotenoids

Papaya provides a unique combination of antioxidant carotenoids. Carotenoids are plant molecules responsible for the bright red, yellow and orange pigments in many fruits and vegetables and are thought to play an important role in maintaining health. They do this by working as an antioxidant to reduce oxidative stress in the body, which is caused by an imbalance between the production of free radicals and reactive oxygen species and the body's antioxidant defences. Oxidative stress has been recognised as the main contributor to the development of age-related diseases like metabolic syndrome, diabetes, heart disease, arthritis and cancer¹⁶. A combination of carotenoids appears to work together to provide a greater effect than when they are consumed alone¹⁷.

The carotenoids found in papaya include:

β-carotene:

β-carotene is a pigment that gives papaya its yellowish orange colour. β-carotene is an antioxidant that protects the body from the damaging effects of free radicals¹⁸. In the body, β-carotene converts to vitamin A (retinol) and plays a role in reproduction, eye health, immune function and glowing skin.

Cryptoxanthin:

Like β-carotene, cryptoxanthin is a precursor for vitamin A and also acts as an antioxidant. Research suggests that cryptoxanthin is much better absorbed than other carotenoids, as it is more bioavailable from common food sources such as papaya than β-carotene¹⁹⁻²⁰.

Lycopene:

Lycopene gives red papaya its colour and is not found in yellow-flesh papaw. Like β-carotene and cryptoxanthin, lycopene acts as an antioxidant, and

has demonstrated to defend against oxidative stress more effectively than other carotenoids such as tocopherol, β-cryptoxanthin, β-carotene, lutein, and zeaxanthin²¹. Lycopene also shows anti-inflammatory properties²². Lycopene bioavailability is affected by dietary composition. 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 bioavailability²³.

Lutein and Zeaxanthin:

Lutein and zeaxanthin are the only dietary carotenoids that accumulate in the retina, specifically the macula, and are called macular pigments²⁴. They are fat-soluble and 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 respectively²⁵.

What about the seeds?

Papaya seeds contain protein, dietary fibre, phytochemicals and minerals including magnesium, calcium, zinc and iron. The phenolic compounds such as benzyl isothiocyanate, glucosinolates, tocopherols, cryptoxanthin and β-carotene act as antioxidants, reacting with free radicals to minimise oxidative stress. There is much to still learn about the benefits that these compounds offer, but preliminary research is showing promising effects of their role in blood vessel contraction and blood glucose control²⁶. Papaya seeds offer a spicy kick and can be added fresh to salads or dried and then ground just like peppercorns.



Why you should eat papaya

The Health Science

Australian grown papaya is available all year round, making it an excellent addition to your weekly grocery shop.

Eating hack:
Squeeze lime juice on top of your papaya and enjoy the fresh taste. Or try it with honey and nuts or coconut and sea salt.

11 reasons why you should eat papaya

1. Diets containing a high intake of fruits like papaya and vegetables are associated with better heart health and reduce the risk of coronary heart disease.
2. 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 are essential for glowing skin.
3. Including more fruit like papaya and vegetables in the diet promotes a better balance of gut microbiome, which plays a role in improving mood.
4. Papaya contains water and fibre which are important for maintaining regular bowels.
5. Papaya contains a combination of antioxidants which fight the damaging effects of free radicals and reactive oxygen species, reducing inflammation in the body and supporting immune health.
6. Papaya delivers a nutrient boost. The β -carotene and lycopene in papaya is three times more bioavailable than they are from carrots and tomatoes.
7. Papaya contains the carotenoids lutein and zeaxanthin which are important for maintaining vision and eye health.
8. 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.
9. Papaya is a great choice for mums-to-be because it contains more than a quarter of an adult's daily folate requirements. Folate is essential for normal cell division and growth in pregnancy.
10. Being nutrient rich, low in energy, low in fat and having a moderate GI, papaya is a good choice to satisfy hunger.
11. Papaya is saturated fat free and low in sodium. Diets low in salt and saturated fat reduce blood pressure and total cholesterol respectively.

Heart Friendly

Increasing your fruit and vegetable intake is good for your heart. A strong and consistent body of research from observational studies has found that a diet rich in fruits and vegetables is associated with a reduced risk of coronary heart disease²⁷.

The 2001 Physicians' Health Study found an inverse association between vegetables rich in carotenoids and coronary artery disease risk in men²⁸, 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 men and women²⁹.

This inverse relationship between fruit and vegetable consumption and heart health benefits appears to be graded in a dose-response fashion. At least eight servings of fruit or vegetables per day is associated with the lowest risk of coronary heart disease²⁹, while for stroke, the risk reduction plateaus at six servings per day³⁰.

Most subgroups of fruits and vegetables have been associated with reduced mortality when eaten in higher amounts³¹. Rich coloured vegetables and fruits like papaya, tend to be more nutrient dense than white and lighter coloured fruits and vegetables³². It is thought the protective effects against heart disease may be partly attributed to dietary phytochemicals³³ and their antioxidant activity, protecting cells and tissues from oxidative damage³⁴⁻³⁵. Papaya contains a unique bundle of phytochemicals including lycopene, β -carotene, lutein, zeaxanthin, folate and cryptoxanthin.

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 low total blood cholesterol levels and normal blood pressure keep the heart healthy⁹.

Papaya is a versatile fruit that can be used in both sweet and savoury dishes and enjoyed at all meals – think papaya boat for breakfast, sliced papaya through a salad at lunch and mashed papaya mixed into your evening curry.



Glowing Skin

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

Carotenoids, β -carotene and lycopene, accumulate in all layers of the skin and contribute to skin colouration – particularly yellow-orange hue – to provide a natural glow³⁶⁻³⁷. Research shows carotenoid skin colouration is perceived by young adults to be healthier and more attractive than tanning³⁸⁻⁴¹.

According to Australian research, 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 a desirable characteristic of skin yellowness⁴².

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 appearance⁴³.

In the other study published in the Journal of the Academy of Nutrition and Dietetics, researchers found skin 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 period⁴⁴.

Carotenoids may also play a beneficial role in the prevention of skin aging, especially photoaging, as they increase the concentration of antioxidants in the blood and skin, improving skin barrier strength⁴⁴. There is also some evidence that lycopene and β -carotene increase the basal skin defence against UV light-mediated damage, working to protect the skin from the sun's rays⁴⁵⁻⁴⁷. These carotenoids cannot be compared to sunscreen, however.

Papaya's high vitamin C content helps with collagen production providing the skin with support and elasticity²³, while the antioxidant properties of vitamin C eliminate cellular reactive oxygen species to relieve skin aging⁴⁸. Finally, the vitamin A in papaya plays a key role in the formation and repair of skin cells¹¹, while papaya's high water content maintains skin internal balance and tissue function, keeping skin hydrated and glowing⁴⁹.

Good Mood Food



The whole diet largely impacts mood and mental health⁵⁰. According to a growing body of research, a diet rich in vegetables, fruits such as papaya, wholegrains 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 depression⁵¹⁻⁵⁴. Diet quality is becoming a key factor in influencing mental and brain health across all stages of life.

In 2016, Deakin University's The SMILES trial became the first randomised controlled study in the world to demonstrate that improving diet quality using a modified Mediterranean diet model can be effective in improving the mental health of individuals with clinically diagnosed depression⁵⁵.

Potential mechanisms for the role food plays in mood include the effect on brain plasticity, gut microbiota and inflammatory and oxidative stress pathways. The high content of antioxidants in fruit and vegetables protect against the negative effects of oxidative stress such as neuronal damage⁵⁶. 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 stress⁵⁷.

Protective benefits could also come from folate, as low dietary folate and low folate status is associated with increased risk for depression. Inadequate folate levels alter neurotransmitter levels, increase homocysteine levels and have direct effects on central nervous system function⁵⁸.

Finally, dietary fibre has a unique impact on the composition of gut microbiota and metabolism. A typical Western-style diet is 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^{57,59}. Emerging evidence suggests gut microbiota can influence mood and behaviour⁶⁰.

Papaya contains a unique bundle of antioxidants, folate and fibre.

Healthy Gut



Papaya is a source of fibre, with one serve containing 11% 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 keeping 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 gut⁶¹⁻⁶², thereby helping to improve overall health and wellbeing. Soluble fibre also helps lower cholesterol levels⁶³ and stabilise blood sugar levels⁶⁴.

In contrast, insoluble fibres reach the bowel undigested and play an important role in normalising large bowel function and preventing constipation⁶¹. 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 healthy⁶².



To select the perfect papaya, gently squeeze the papaya under the stem. It will give slightly if it's ripe. If your papaya is a bit hard, place your papaya in a fruit bowl to ripen and move it to the fridge when it's ripe enough to eat.

Immune Boost



Papaya contains a unique combination of antioxidants including vitamin A, vitamin C, lutein, zeaxanthin, cryptoxanthin and β -carotene. These antioxidants improve gut microbiome and help fight the damaging effects of free radicals in the body, supporting the immune system.

The immune system is highly reliant on accurate cell to cell communication for optimal function and any damage to the signalling systems involved will result in an impaired immune response. In particular, the immune system is sensitive to oxidative stress. Dietary antioxidants can enhance immune function through their ability to lower oxidative stress and reduce inflammation.

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 disease⁶⁵⁻⁶⁶.

In contrast, the Mediterranean diet which is rich in fruits, vegetables, nuts, legumes, fish and healthy fats has been found to reduce the risk of poor health thanks to the protective benefits of the bioactive compounds found in fruits and vegetables and their ability to lower inflammation and support the immune system⁶⁷⁻⁶⁸.

Nutrient Hit



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 β -carotene and lycopene⁶⁹.

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

The unique combination of carotenoids found in papaya provides a further nutrient boost, with research showing a combination of carotenoids work synergistically together to provide a greater effect than when they are consumed alone¹⁷.

Eye Health



Some of the most important carotenoids for human health include β -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 vision⁷⁰. Research shows that lutein and zeaxanthin are important dietary carotenoids in preventing and reducing cataracts and age-related macular degeneration⁷¹⁻⁷². Studies suggest almost 100% of the lutein, zeaxanthin (and cryptoxanthin) found in fruit is absorbed by the body²⁵.

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

Good for Mum and Bub



Before, during and after pregnancy, papaya's essential nutrients and antioxidants can provide mums with important nutrients for the growth and development of their babies. A mother's diet quality can change the development of her baby in ways that can influence the child throughout their lifetime⁷³.

Papaya is a source of fibre and is important for promoting regular laxation in mums and their babies. 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 anencephaly⁷⁴.

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 β -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. Early research published shows the 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 microbiome⁷⁵.

Folate, vitamin C, vitamin A and potassium, all of which are found in papaya, are important for the normal growth and development in children. Vitamin A and vitamin C are also important for healthy immune system function and reducing tiredness and fatigue.

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