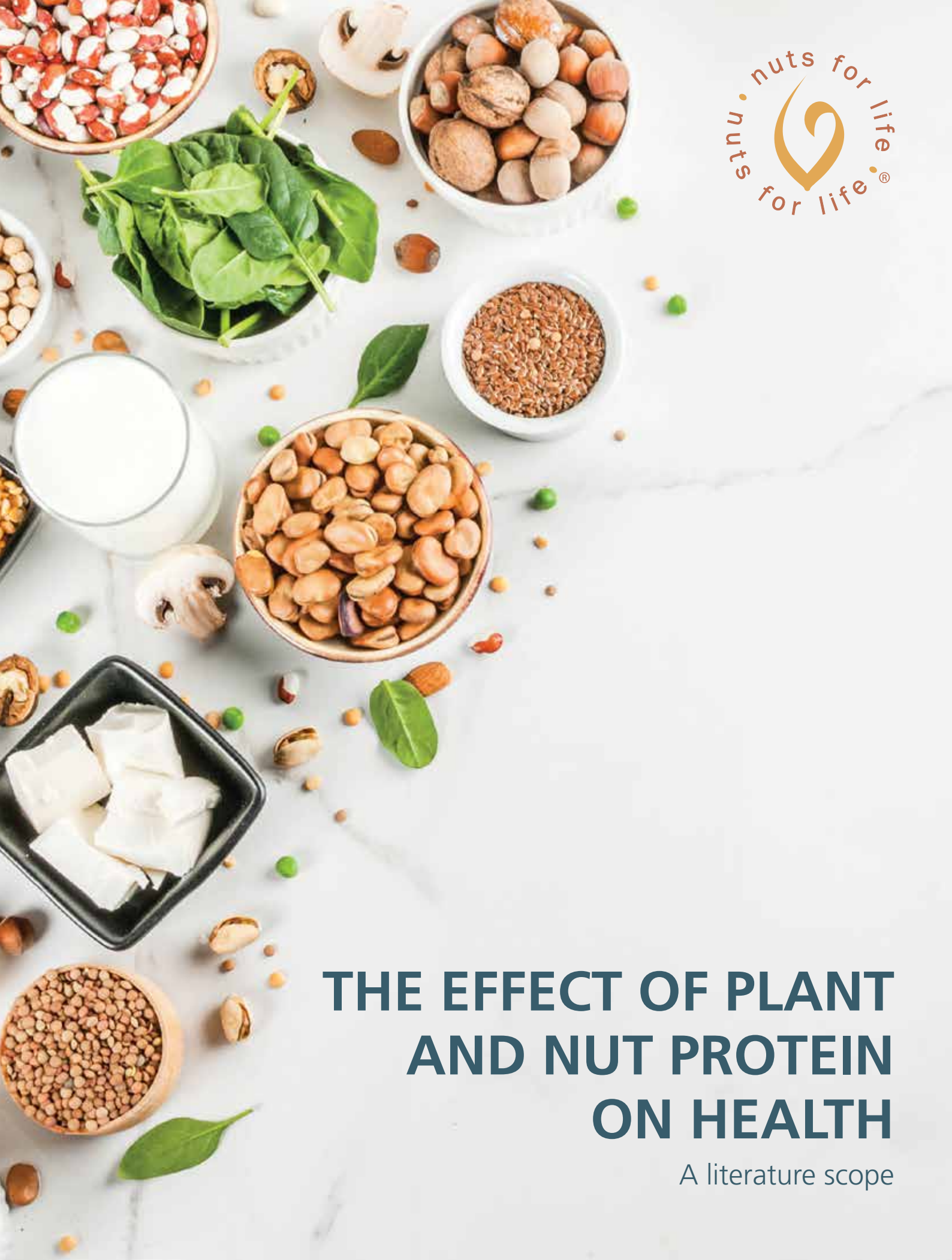

THE EFFECT OF PLANT AND NUT PROTEIN ON HEALTH

A literature scope

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FORWARD

Plant-based eating patterns have incredible potential to improve both human and planetary health. Estimates suggest around 11 million deaths worldwide could be prevented if our current diet moved towards a more plant-based diet.

Diets in which plants take centre stage have been associated with lowering the risk of type 2 diabetes, cardiovascular disease, hypertension, obesity, metabolic syndrome and all-cause mortality.

Taking this a step further, research suggests a reduced risk of chronic disease when more of the protein comes from plant-based foods, including nuts.

Existing research points to the powerful effect of plant protein on improving markers of cardiovascular disease. Emerging evidence suggests that nut protein, in particular, may be more effective at reducing cardiovascular disease mortality than other sources of plant protein. We are only just beginning to understand the potential of nut protein for human health.

Nuts generally have higher total protein content per 100g than other common plant foods, and are the richest plant source of the beneficial amino acid arginine.

Beyond their protein content, nuts offer equivalent or higher levels of a wide range of nutrients and bioactives, including healthy unsaturated fats, phosphorous, copper, manganese and melatonin, compared with other sources of plant protein.

According to the EAT-Lancet Commission on Food, Planet and Health, to achieve recommendations for improved human and planetary health, global intake of nuts needs to double.

Given their high level of plant protein, including a daily handful of nuts (30g) may be an effective and yet, easy way to help Australians embrace plant-based eating patterns - a win for their health and that of our planet.

Flavia Fayet-Moore, PhD, APD, FASLM
Chief Executive Officer
Nutrition Research Australia

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Embrace plants as a source of protein -
EAT-Lancet Commission on Food, Planet and Health.

INTRODUCTION

Nutrition Research Australia (NRAUS) was commissioned by Nuts for Life to scope the published scientific literature on the effect of plant and nut protein on human and planetary health.

The literature scope was conducted using PUBMED and Google Scholar. Systematic and authoritative literature reviews, randomised controlled trials and cohort studies, published in the past 20 years, formed the basis of the scope. Relevant grey literature was also reviewed.

NRAUS' literature scope uncovers some new insights into the unique contribution of nut protein to health. The good news is that nuts are one of the best sources of plant-based protein, and this protein appears to play at least some part in modulating shifts towards better health.

This adds to a large body of existing evidence on the health benefits of a daily 30g handful of nuts.

Transformation to healthy diets requires substantial dietary shifts, where global consumption of nuts, fruits, vegetables and legumes will need to double -
EAT-Lancet Commission on Food, Planet and Health.

WHAT DOES THE EVIDENCE TELL US?

PLANT PROTEIN

Evidence points to the benefits of plant protein for health.

Plant protein is associated with reduced risk of cardiovascular disease, type 2 diabetes and all-cause mortality, and improved glycaemic control.

Eating plant protein improves markers of cardiovascular disease.

Replacing animal protein with plant protein improves total cholesterol, LDL cholesterol, HDL cholesterol, VLDL cholesterol, apolipoprotein B and triglycerides.

Plant proteins contain higher amounts of arginine and cysteine.

This unique amino acid profile could help explain the protective health effects of plant protein.

Replacing animal protein with plant protein improves planetary health.

Global intake of nuts needs to double to meet dietary recommendations for both human and planetary health.

NUT PROTEIN

Nut protein may be more effective at reducing cardiovascular disease mortality than other sources of plant protein.

Improved cardiovascular health is likely a result of the unique protein profile of nuts, alongside other nut nutrients and bioactives.

Nuts generally have the highest total protein content among common plant-protein sources, including grains, legumes and soy.

They also have a unique amino acid composition, and are one of the richest plant sources of arginine and cysteine.

Nuts have higher levels of certain nutrients and bioactives than other common sources of plant protein.

They offer unsaturated fatty acids, are generally higher in phosphorous, copper and manganese, and contain the most melatonin.

PLANT PROTEIN & HEALTH

A body of evidence tells us that eating patterns in which plants take centre stage are associated with lowering the risk of type 2 diabetes, cardiovascular disease (CVD), hypertension, obesity, metabolic syndrome and all-cause mortality.[1]

Taking this a step further, research suggests a reduced risk of disease when *protein* comes from plants, such as nuts, grains and beans, instead of from animal sources.

The most compelling evidence, from systematic literature reviews and meta-analyses of intervention studies, is that a diet high in plant protein (>50% of total protein intake from plant sources), in substitution for animal protein, is protective against a range of CVD markers.[2-5]

The strongest evidence	Replacing animal protein with plant protein improves markers of cardiovascular disease – specifically, total cholesterol, LDL cholesterol, HDL cholesterol, VLDL cholesterol, apolipoprotein B and triglycerides.[2-4]
Other evidence	Increasing intake of plant-based sources of protein, including nuts, is associated with: – Reduced risk of cardiovascular disease[6] – Reduced risk of type 2 diabetes[7-9] – Reduced risk of all-cause mortality[10,11] – Improved glycaemic control in adults with type 2 diabetes.[8] Consuming protein, from both plant and animal sources, improves blood pressure, particularly in older age groups and people with hypertension.[12,13]
Emerging evidence	Plant protein may have a favourable effect on body weight, satiety and lean body mass, but further research is needed in these areas.[14-16]

Replacing just 3% of energy per day from animal protein with plant protein was associated with a 5% lower mortality risk from all causes.[11]

Compared with the consumption of animal protein, plant protein:*[2-4]
↓ total cholesterol by 0.19 mmol/L
↓ triglycerides by 0.07 mmol/L
↓ LDL-cholesterol by 0.19 mmol/L
↓ VLDL-cholesterol by 0.05mmol/L
↓ LDL-C/HDL-C ratio by 0.20 mmol/L
↓ Apolipoprotein B by 0.05g/L
↑ HDL-cholesterol by 0.03 mmol/L

**Mean differences. Effects hold after adjusting for a range of potential dietary confounders, including whole grains, fruit and vegetables, glycaemic index and fatty acid composition. Effects have been reported in both normal and hypercholesterolemic people.*

MECHANISMS OF ACTION

A number of potential mechanisms have been suggested to explain the favourable effects of plant protein on health.[17] The exact mechanisms, however, are unclear.

- The differing amino acid profiles of plant and animal proteins is one potential mechanism. Plant protein sources are generally high in arginine and cysteine, and lower in leucine and histidine, compared with animal sources. These differences may help explain the beneficial effect of plant protein on health.
- Health effects might not be due to a single amino acid, but rather from the combined effects of a number of amino acids. Further research on these mechanisms is needed.

HOW DO PLANT-BASED PROTEIN SOURCES COMPARE?

Nuts generally have the highest total protein content among common sources of plant-protein, including grains, legumes and soy. Most tree nuts provide 3-6g of protein per 30g handful – or around 10-20g of protein per 100g. Some seeds are also particularly rich in plant-based protein.

Nuts generally have the highest total protein content among common sources of plant-protein, including grains, legumes and soy.

Protein content of some plant-protein food sources			
Food	**Serve size***	**Protein (g) per serve**	**Protein (g) per 100g**
Pumpkin seeds	30g	9.0	30.2
Sunflower seeds	30g	6.8	22.7
Almonds	**30g (handful)**	**5.9**	**19.7**
Pistachios	**30g (handful)**	**5.9**	**19.7**
Cashews	**30g (handful)**	**5.1**	**17.0**
Hazelnuts	**30g (handful)**	**4.5**	**14.8**
Brazil nuts	**30g (handful)**	**4.3**	**14.4**
Walnuts	**30g (handful)**	**4.3**	**14.4**
Chia seeds	30g	4.2	14.0
Kidney beans (fresh,boiled)	75-150g (½ - 1 cup)	10.4-20.7	13.8
Soybeans (dried, boiled)	75-150g (½ - 1 cup)	10.1-20.3	13.5
Pine nuts	**30g (handful)**	**3.9**	**13.0**
Tofu	170g	20.4	12.0
Whole wheat breakfast biscuits	30g (2 biscuits)	3.6	12.0
Wholemeal bread	40g (1 slice)	4.5	11.2
Pecans	**30g (handful)**	**2.9**	**9.8**
Macadamias	**30g (handful)**	**2.8**	**9.2**
Lentils (dried, boiled)	75-150g (½ - 1 cup)	5.6-11.0	7.3
Kidney beans (canned)	75-150g (½ - 1 cup)	5.0-9.9	6.6
Chickpeas (canned)	75-150g (½ - 1 cup)	4.7-9.3	6.3
Baked beans (canned)	75-150g (½ - 1 cup)	3.7-7.4	4.9
Chestnuts	**30g (handful)**	**1.0**	**3.4**
Rice (white, boiled)	½ cup (80g)	2.5	3.1
Potato (new, peeled, boiled)	75g (½ medium)	1.9	2.5
Oats (cooked porridge)	½ cup (120g)	2.9	2.4
Apple	150g (1 medium)	0.5	0.3

Figures from the Australian Food Composition Database' (Release 1).
**Based on the serve sizes outlined in the Australian Guide to Healthy Eating.*

Note: A serve of legumes is: as a vegetable serve = 75g (½ cup cooked legumes); as a meat alternative serve = 150g (1 cup cooked legumes).

NUT PROTEIN & HEALTH

Nuts are important foods that influence health.

The Australian Institute of Health and Welfare's latest Burden of Disease study found a low intake of nuts and seeds was the third most important dietary factor impacting disease, more so than a low intake of vegetables and a high intake of sugar-sweetened beverages.[18]

Most Australians fall short of the recommended 30g of nuts a day, with a mean daily intake of just 4.6g.[19]

Traditionally, the benefits of nuts have been attributed to their healthy mono- and poly-unsaturated fatty acids, dietary fibre, and other nutrients and bioactives, such as vitamin E, magnesium and phytosterols.

But nuts also provide significant amounts of protein, and it is likely this plays at least some part in many of the health benefits linked with nut consumption.

Emerging evidence suggests plant protein from nuts may be more effective at reducing CVD mortality than other sources of plant protein.[20]

The Adventist Health Study 2, a large cohort of more than 81,000 US-based adults, found protein from 'nuts and seeds' was associated with a 40 per cent lowered risk of CVD mortality.[20]

In young adults (25-44 years) the association was even stronger, with a 60 per cent reduction in the risk of CVD mortality. No significant associations were found for protein from 'grains', 'legumes, fruits and vegetables' or 'processed foods', suggesting that nuts and seeds are unique among the sources of plant protein.

The favourable effects of nuts on weight and type 2 diabetes outcomes are, at least in part, thought to be due to their protein content.[21]

Protein from 'nuts and seeds' was associated with 40–60% reduction in risk of CVD mortality. No significant associations were found for protein from 'grains', 'legumes, fruits and vegetables' or 'processed foods'.

A UNIQUE PROTEIN & AMINO ACID PROFILE

Compared to other plant protein sources,[27] nuts are generally:

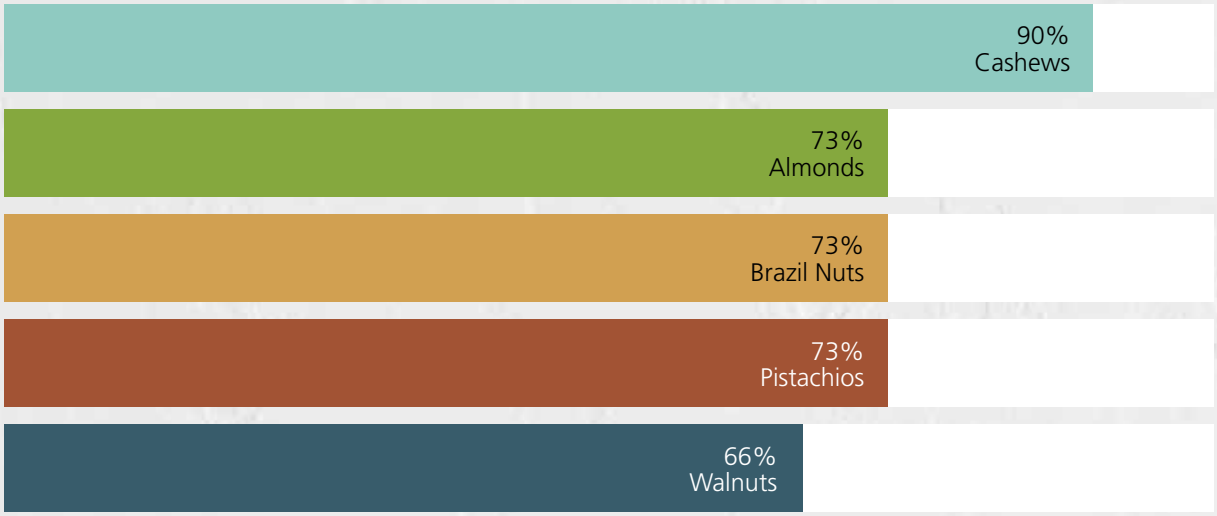
- ✓ Higher in total protein
- ✓ Highest in arginine, with a high arginine: lysine ratio
- ✓ Higher in cysteine
- ✓ Lower in threonine, tryptophan, isoleucine, lysine and other sulphuric amino acids
- ✓ Higher in mono- and poly-unsaturated fats
- ✓ Higher in phosphorus, copper and manganese
- ✓ Highest in melatonin
- ✓ Lower in some antinutrients
  - – Lower trypsin inhibitors (when compared to legumes)
  - – Lower tannins (when compared to legumes and grains)
  - – Lower saponins and lectins (when compared to legumes)

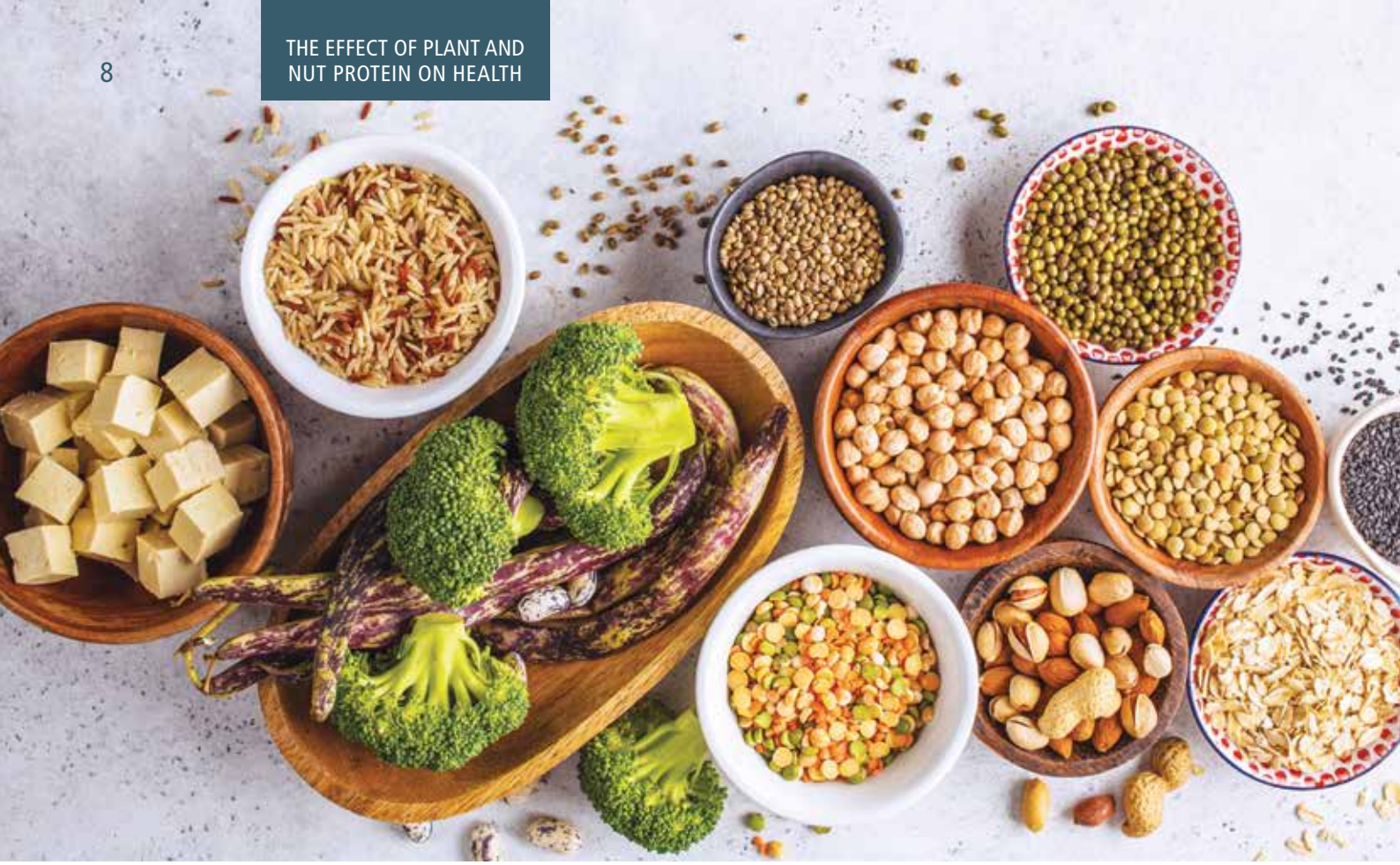
The protein digestibility (or 'protein quality') of tree nuts is similar to many other plant protein sources.[28-30] And combining foods increases the protein digestibility. For example, combining nuts with legumes provides all essential amino acids, increasing protein digestibility to 100 per cent.

Beyond their protein content, nuts have equivalent or higher levels of a wide range of nutrients and bioactives compared to other plant protein sources – from unsaturated fatty acids, micronutrients, and even melatonin.[6,31]

Of all plant foods, nuts contain the highest amount of melatonin – the hormone best known for regulating the body's circadian rhythms.

Protein Digestibility Corrected Amino Acid Score (PDCAAS) of some tree nuts[28-30]





Health is the main reason Australians choose to eat less meat, closely followed by a four-way tie: the environment, animal welfare, cost, and an increasing availability of plant-based options.[33]

PLANT PROTEIN & PLANETARY HEALTH

Evidence suggests that replacing animal protein with plant protein improves planetary health.[32]

The EAT-Lancet Commission on Food, Planet and Health states that to achieve dietary recommendations for improved human and planetary health, global intake of nuts (along with vegetables, fruits, legumes and whole grains) needs to double from current consumption levels, while consumption of red meat will need to reduce by 50 per cent.[32]

According to the landmark report, a diet that includes more plant-based foods and fewer animal sourced foods is healthy, sustainable, and good for both people and planet. The authors state it is not a question of all or nothing, but rather small changes for a large and positive impact.

HOW TO EMBRACE PLANT PROTEINS

- ✓ Enjoy a healthy handful of nuts each day
- ✓ Incorporate legumes, like lentils and beans, into meals 2-3 times per week
- ✓ Swap one or more meat meals a week for a plant-protein source, like tofu or beans
- ✓ Choose wholegrain foods like rolled oats, brown rice, wholegrain breads and quinoa
- ✓ Add seeds such as sunflower, pumpkin or chia to salads and trail mixes

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About Nuts for Life

Nuts for Life is the health education initiative from the Australian tree nut industry. We are Australia's leading authority on the nutrition and health benefits of tree nuts. Our mission is to promote regular nut consumption by collating the latest evidence-based information, and informing Australians about the positive impact regular nut consumption can have on their health.

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The literature scope that informed this report was prepared by Nutrition Research Australia.

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