

Nut Grower's Guide

The Complete Handbook for Producers and Hobbyists

Jennifer Wilkinson

This book is available from Landlinks Press through our secure online ordering facility at <http://www.landlinks.com> or from:

Customer Service
Landlinks Press
PO Box 1139
Collingwood Victoria 3066
Australia

Telephone +61 3 9662 7666
Local call 1300 788 000 (Australia only)
Fax +61 3 9662 7555
Email publishing.sales@csiro.au

© Jennifer Wilkinson 2005

The sample pages following are provided solely for information purposes and may not be reproduced, stored or transmitted in any form or by any means without prior permission of the copyright owner. Contact Landlinks Press for all permission requests.

Introduction

It is no secret that nuts have been a valued food since prehistoric times. Nut harvest was a time of ceremony for hunter-gatherers, and today nuts continue to be considered gourmet food. In fact, consumption of nuts and nut products is increasing and medical authorities are recommending more nuts in the diet for health reasons. This is very good news for nut growers.

Nut production in Australia has increased significantly over the past two decades. The size of nut orchards has also increased. Yet while the greater efficiency of large orchards and the positive market situation has generated interest from investors, the majority of nut orchards continue to be run as family businesses. In addition, many orchards are an important part of 'lifestyle farming' and provide loads of fun and satisfaction for weekend and semi-retired farmers.

Of the eight tree nut crops grown commercially in Australia, production volumes of four of these crops (almonds, macadamias, pecans and pistachios) is substantial and supported by modern processing and marketing facilities. Production of the other four nut crops is increasing at varying rates. Chestnut production has been relatively static for some years but production is now set to increase as chestnut processing opportunities are developed. Walnut production has also remained reasonably static over the past few decades but crops from large new orchards have boosted recent production and a rapid increase is expected within the next few years. It is expected that development of high-capacity walnut processing facilities will follow. Cashew production has been investigated since the 1960s but the difficulty in processing cashew product has thwarted development. At this stage cashew production is limited to one commercial grower with a few other plantations on the horizon. Hazelnuts have been grown widely in Australia for many decades on small-scale orchards, but larger plantings are being developed and the hazelnut industry is looking toward a positive future.

Different tree nuts are grown in different climates, from the tropics to cool temperate zones. Each nut type has a particular set of cultural requirements and processing and marketing systems. So what are these requirements and which nut grows best where? The information in this book comes from a combination of first hand experience, personal communication with others involved in the nut industries, and literary research. As editor of Australia's only nut industry journal for almost ten years, my knowledge of nut production increases with each issue that is published. Similarly, as a walnut grower, my knowledge of walnut cultivation and processing is fine-tuned as each season passes.

It is thirty years since my husband and I planted our first walnut trees and in that time there have been huge technical changes to walnut cultivation. Perhaps the greatest

change was brought about with the introduction of lateral bearing cultivars from California. No longer were walnut trees managed as large individuals because lateral-bearing cultivars can be planted as in other high density orchards. The result has been greater yields per hectare and greater efficiency in orchard management. The changing walnut scene is typical of other types of tree nuts.

As with most forms of farming, the never-ending discoveries about the nut trees that you grow, and observing the results of new techniques you try, makes nut production an absorbing and stimulating occupation. Each new season provides a new opportunity to do better than what you did last year. The eternal quest of every grower is, or should be, to produce high quality nuts in the most efficient and most sustainable manner possible. To achieve this to one's satisfaction may take a lifetime, but what a challenging life it will be.



Large chestnut trees provide dense shade in summer

1

What's in a nut?

Nuts are amazing little packages. They taste delicious, they're one of the most nutritious foods available and dried nuts can be stored without refrigeration. No wonder they became a favoured food by hunter-gatherers and remain a gourmet food today. From a botanical point of view a nut can be defined as a hard-shelled fruit, or a seed containing an edible kernel. Peanuts are not true nuts; they are a type of legume. There are numerous different types of nuts grown around the world, however, the tree nuts grown in Australia are the focus of this book. Tree nuts include almonds, Brazil nuts, cashews, chestnuts, hazelnuts, macadamias, pecans, pine nuts, pistachios and walnuts.

Nuts that fall from the tree will germinate when planted and the concentrated food reserves within the kernel sustain the young growing plant. This concentrated food reserve provides a rich source of nutrients in the human diet. These nutrients include fats, proteins, carbohydrates and fibre, and also vitamins, minerals and phytochemicals.

The health benefits of nuts

Scientific evidence on the health benefits of nuts has been accumulating for many years as scientific institutions around the world research the properties of nuts and their benefits to human health. In 2003 the Australian Nut Industry Council Ltd launched the 'Nuts for Life' program to compile existing information on the health benefits of nuts and communicate this information to health authorities and health professionals.

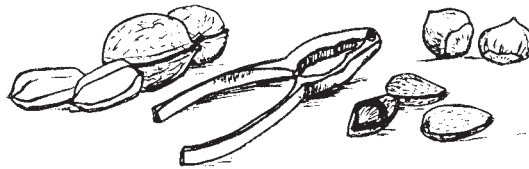
Scientific research shows that eating nuts regularly is beneficial to health. For instance, four major epidemiological studies have shown that frequent nut consumption confers protection against coronary heart disease, with a level of risk reduction of up to 53% in those eating nuts five or more times a week compared with people eating nuts twice a week or less¹⁻⁴. The cardiovascular benefits of nuts have been attributed to their

favourable fatty acid profile along with their vitamin E, antioxidants, folate, arginine and phytosterol content.

Epidemiological studies show consumption of tree nuts is associated with a lower risk of prostate cancer⁵ while in vitro and animal studies show potential anti-cancer properties in certain components of tree nuts^{6,7}. A recent epidemiological study showed that women who ate nuts five or more times a week had 27% lower risk of developing diabetes compared with women who ate nuts twice a week or less⁸. While at present not all tree nuts have been glycemic index tested, pecans and cashews which have been tested have a low glycemic index. Tree nuts also provide monounsaturated fatty acids and contain dietary fibre — all nutritional attributes that assist with optimal glycemic control. Tree nuts are also a source of the amino acid arginine that has been shown to improve insulin sensitivity and reduce the risk of complications in people with diabetes.

Research also shows that higher protein, moderate fat diets may be more effective for weight loss than high carbohydrate, low fat diets due to their beneficial effects on satiety, improved metabolic parameters and an increase in the thermogenic component of the metabolic rate^{9,10}.

Unfortunately, a small percentage of the population have an allergy to nuts. Health officials have reported that the incidence of nut allergies is increasing. Severe reactions (anaphylaxis) can result in death if not treated immediately. Peanut allergies affect 2% of children in the preschool age group and 60% of these children will also have an allergy to a nut other than peanuts. As a result of the increasing incidence of nut allergies in Australia, nuts are becoming a prohibited food for young children at childcare centres and primary schools. It is reported that the processes of maturation, roasting and curing, that increase flavour and shelf life of peanuts, all increase their allergenic properties. These processes are also likely to be important in modifying the allergenic properties of other nuts (Soutter 2004).



What are the healthy substances in nuts?

The following information has been sourced from scientific studies conducted worldwide. These studies are summarised in the Fact Sheets published by Nuts for Life, an initiative of the Australian Nut Industry, Copyright 2003, Horticulture Australia Limited.

Oils

Nuts are a great source of healthy oils. These are the oils that are high in monounsaturated or polyunsaturated fats. Nuts high in monounsaturated fats include macadamias, cashews, almonds, pistachios and pecans. Nuts that are high in polyunsaturated fats include walnuts, hazelnuts, pine nuts and Brazil nuts.

Low glycemic index

Pecans and cashews have a low glycemic index (GI), meaning that the carbohydrate they contain is broken down slowly by the body. The GI of other tree nuts is yet to be tested. Low GI foods assist in the management of weight, blood glucose levels and cholesterol.

Fibre

All nuts contribute fibre to the diet. Dietary fibre helps to lower blood cholesterol and is essential for healthy bowel function.

Vitamin E

Vitamin E is an antioxidant that helps protect tissues in the body from damage.

Folate

Folate is a B vitamin associated with heart health, cancer prevention and decreases the risk of birth defects in babies.

Magnesium

Magnesium is a mineral essential for good nerve and muscle function and for strong bones.

Zinc

Zinc is needed for many processes in the body and is necessary for a strong immune system and healing and protecting the skin.

Selenium

Selenium is essential for a well functioning immune system and thyroid gland. It also helps protect body cells from damage.

Antioxidants

Antioxidants found in nuts include flavonoids and a compound called luteolin. These substances help slow down the aging process and help protect the body from a range of lifestyle related diseases.

Arginine

Arginine is an amino acid that helps keep blood vessels healthy.

Plant sterols

Nuts contain plant sterols that are substances that reduce cholesterol absorption.

Table 1. Nutritional analysis of raw tree nuts

Data obtained from AusNut, Foodworks version 3.01, Xyrus Software unless otherwise indicated. na, not available; nt, not tested. Kilojoule content includes the energy from dietary fibre.

<i>Per 100 g</i>	<i>Almond</i>	<i>Brazil</i>	<i>Cashew</i>	<i>Chestnut</i> ³	<i>Hazelnut</i>
Energy Kj	2525	2888	2437	797	2693
Protein (g)	20.0	14.4	17.0	3.4	14.8
Total fat (g)	55.2	68.5	49.2	0.6	61.4
Saturated fat (g)	3.6	14.8	8.4	nt	2.7
Monounsaturated fat (g)	36	21.8	31.1	nt	48.6
Polyunsaturated fat (g)	13.1	29.0	7.5	nt	7.1
Omega-3 fat (mg) ¹	0	0	0	nt	100
Total CHO (g)	4.4	2.4	16.8	34.3	5.1
CHO sugars (g)	4.4	2.1	5.5	3.8	4.4
Dietary fibre (g)	8.8	8.5	5.9	8.1	10.4
Sodium (mg)	5.0	2.0	11.0	0.7	3.0
Potassium (mg)	690	560	550	574	680
Magnesium	260	350	250	nt	160
Calcium (mg)	235	150	34.0	13.4	86.0
Iron (mg)	3.5	2.2	5.0	0.8	3.2
Zinc (mg)	3.6	4.1	5.5	0.5	2.2
Thiamin (mg)	0.17	0.60	0.64	0.28	0.39
Riboflavin (mg)	1.15	0.43	0.19	0.09	0.17
Niacin (mg)	3.80	0.60	1.80	1.97	2.20
Folate (µg)	49	21	68	<0.1	72
Pantothenic acid (mg) ²	0.349	0.236	0.864	0.56*	0.918
Vitamin B6 (mg) ²	0.131	0.251	0.417	0.5*	0.563
Vitamin A (µgRE)	2.0	2.0	1.0	1.0*	3.0
Vitamin E (mg) ²	26.2	7.6	1.5	0.5*	15.2
Copper (mg) ²	1.11	1.77	2.19	0.51*	1.72
Manganese (mg) ²	2.53	0.77	1.65	1.18*	6.17
Selenium (µg) ²	4.4	2960	20	1.12*	4.0
Arginine (g) ²	2.47	2.39	1.74	0.23*	2.21
Phytosterols (mg) ²	120	na	158	na	96

¹ Meyer *et al.* (1999)

² USA Department of Agriculture Nutrient Database for Standard Reference Release 15.

³ Australia data for dry roasted chestnuts, *USDA data for raw peeled European chestnuts.

⁴ Average quantities excluding nuts with unavailable data

Table 1. Nutritional analysis of raw tree nuts (cont.)

<i>Macadamia</i>	<i>Pecan</i>	<i>Pine nuts</i>	<i>Pistachio</i>	<i>Walnut</i>	<i>Mixed tree nuts⁴</i>
3068	2977	2921	2530	2901	2574
7.6	9.8	13.0	19.7	14.4	13.4
76.2	71.9	70.0	50.6	69.2	57.34
10.3	4.5	4.2	5.8	4.4	6.5
61.4	39.1	23.0	26.6	12.1	33.3
0.9	24.8	39.8	15.8	49.4	20.8
0	600	0	0	6300	778
4.5	4.9	4.5	15.1	3.0	9.5
4.5	4.3	3.4	5.9	2.7	4.1
6.0	8.4	5.1	9.0	6.4	7.7
3.0	3.0	3.0	7.0	3.0	4.1
330	500	600	950	440	587
95	110	230	100	150	160.6
48.0	51.0	11.0	90.0	89.0	80.7
1.8	2.4	4.1	3.9	2.5	2.9
1.2	3.9	5.3	2.3	2.5	3.1
0.28	0.42	0.57	0.58	0.33	0.43
0.10	0.18	0.19	0.29	0.18	0.30
2.00	1.30	4.30	1.50	1.40	2.09
16	39	60	67	66	56.8
0.758	0.863	0.210	0.520	0.570	0.585
0.275	0.210	0.111	1.700	0.537	0.470
0	4.0	2.0	22.0	4.0	4.1
0.5	4.1	na	4.6	2.9	7.0
0.75	1.20	1.04	1.30	1.58	1.32
4.13	4.50	4.33	1.20	3.41	2.99
4	6	na	7	5	335
1.38	1.18	2.25	2.13	2.28	1.83
114	102	na	214	72	125

References

1. Kushi, L. H., Folsom, A. R., Prineas, R. J., Mink, P. J., Wu Y., and Bostick, R. M. (1996). Dietary antioxidant vitamin and death from coronary heart disease in postmenopausal women. *New England Journal of Medicine* 34, 1156–1162.
2. Hu, F. B., and Stampfer, M. J. (1998). Nut consumption and risk of coronary heart disease: a review of epidemiologic evidence. *Current Athero Reports* 1, 205–210.
3. Albert, C. M., Gaziano, M. J., Willet, W. C., and Manson, J. E. (2002). Nut consumption and decreased risk of sudden cardiac death in the Physicians' Health Study. *Archives of International Medicine* 162, 1382–1387.
4. Fraser, G. E., Sabate, J., Beeson, W. L., and Strahan, T. M. (1992). A possible protective effect of nut consumption on risk of coronary heart disease. The Adventist Health Study. *Archives of International Medicine* 152, 1416–1424.
5. Jain, M. G., Hislop, G. T., Howe, G. R., and Ghadirian, P. (1996). Plant foods, antioxidants, and prostate cancer risk: findings from case-control studies in Canada. *Nutrition and Cancer* 34(2), 178–184.
6. Ip, C., and Lisk, D. J. (1994). Bioactivity of selenium from Brazil nut for cancer prevention and selenoenzyme maintenance. *Nutrition and Cancer* 1(3), 203–212.
7. Narayanan, B. A., Geoffroy, O., Willingham, M. C., Re, G. G., and Nixon, D. W. (1999). p53/p21WAF1/CIP1 expression and its possible role in G1 arrest and apoptosis in ellagic acid treated cancer cells. *Cancer Letters* 136(2), 215–221.
8. Jiang, R., Monson J. E., Stampfer J. J., Liu S., Willett W. C., and Hu, F. B. (2002). Nut and peanut butter consumption and risk of Type 2 diabetes in women. *Journal of the American Medical Association* 288, 2554–2560.
9. Eisenstein, J., Roberts S. B., Dallal, G., and Saltzman, E. (2002). High-protein weight-loss diets: are they safe and do they work? A review of the experimental and epidemiologic data. *Nutrition Review* 60(7), 189–200.
10. McManus, K., Antinoro, L., and Sacks, F. (2001). A randomised controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults. *International Journal of Obesity* 5, 1503–1511.

Further reading

Australian Nut Industry Council Ltd website <http://www.nutindustry.org.au>

Boutrif, E. (2000). Minimising mycotoxin risks. *Australian Nutgrower* 14(1), 11–13.

Cowart, G. (2003). Nuts for health program launched. *Australian Nutgrower* 17(2), 3.

Hasler, C. M., Kundrat S., and Wool, D. (2001). Studies prove nuts a functional food.

Australian Nutgrower 15(4), 24.

International Nut Council (2000). Nut research shows health benefits of nuts. *Australian Nutgrower* 14(3), 39.

International Tree Nut Council website <http://www.nuthealth.org>

Joyce, C. (2003). Nuts for health campaign. *Australian Nutgrower* 17(1).

Meyer, B. J., Tsisivis, E., Howe, P. R. C., Tapsell, L., and Calvert, G. D. (1999).

Polyunsaturated fatty acid content of foods: differentiation between long and short chain Omega-3 fatty acids. *Food Australia* 51(3), 81–95.

-
- Nunez, I., Perez-Heras, A., Serra, M., Gilabert, R., Casals, E., and Deulofeu, R. L. (2004).
New study of walnuts – cardio-protective effect beyond cholesterol-lowering.
Australian Nutgrower, 18(3), 39.
- Nuts for Life (2003). Fact Sheet 1. 'Nuts and General Health.' (Horticulture Australia Ltd:
Sydney, NSW.)
- Nuts for Life website <http://www.nutsforlife.com.au>
- Savage, G. P. (2000). The Nutritive value and composition of nuts commonly eaten by
humans. Research Project, Food Group. (Lincoln University: Canterbury, New
Zealand.)
- Somerset, S. (2000). Mediterranean diet versus low fat diet. In 'Proceedings of the
Australian Nutgrowers Conference'. p. 38. (Australian Nut Industry Council Ltd:
Lismore, NSW.)
- Soutter, V. (2004). Allergic reactions to nuts. *Australian Nutgrower* 18(3), 38.
- Spiller, G. (1999). 'Healthy Nuts'. (Avery Publishing Group: New York, USA.)
- Walker, R. (2003). Is it all a big fat lie? In 'Proceedings of the Australian Nutgrowers
Conference'. pp. 29–32. (Australian Nut Industry Council Ltd: Lismore, NSW.)