PFR SPTS No. 12109

Nutritional Analysis of Mushrooms - A summary

Lister CE

September 2015















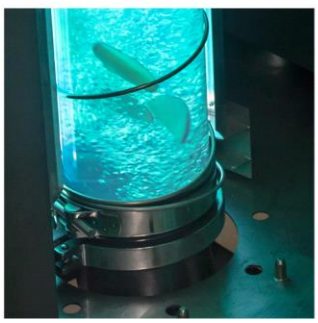


Report for:
Meadow Mushrooms Ltd

PUBLICATION DATA

Lister CE. September 2015. Nutritional Analysis of Mushrooms - A summary. A Plant & Food Research report prepared for: Meadow Mushrooms Ltd. Milestone No. 52658. Contract No. 29245. Job code: P/251001/01. SPTS No. 12109.

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September 2015

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EXECUTIVE SUMMARY

Nutritional Analysis of Mushrooms - A summary

Lister CE
Plant & Food Research: Lincoln

September 2015

This report is a summarised version of the following report:

Lister CE. May 2013 Nutritional Analysis of Mushrooms. A report prepared for: Meadow Mushrooms Ltd. Plant & Food Research data: Milestone No.52658. Contract No. 29245. Job code: P/251001/01. SPTS No. 8358.

A new health claims standard (FSANZ Standard 1.2.7) came into force in January 2013 and allows an extended range of preapproved general level health claims on pack as long as certain criteria are met. The aim of this project for Meadow Mushrooms was to gather nutritional data for two Meadow Mushroom products: white button and Portabello mushrooms. This will enable health claims to be made for mushrooms.

Composite samples of both pre-packed and loose white button and Portabello mushrooms grown by Meadow Mushrooms were gathered from five supermarkets in three different cities (Christchurch, Palmerston North and Auckland; note loose mushrooms were not analysed from Palmerston North due to the possibility of incorrect product in the boxes). Data generated were used to generate possible NIPs for mushrooms (as below). A number of vitamins and minerals were present at above 10% of the RDI/ESADDI and hence claims can be made, so these are included in the NIP. Differences between the white buttons and Portabellos were quite small in most cases. This data is specific to mushrooms grown by Meadow Mushrooms.

Example of a standard NIP for white button mushrooms:

NUTRITION INFORMATION

Servings per package: 2.5
Serving size: 100 g

	Quantity per 100 g Serving	% Daily intake per serve
Energy	78 kJ	1%
Protein	2.8 g	6%
Fat, total	0.5 g	1%
– saturated	0 g	0%
Carbohydrate	0 g	0%
- sugars	0 g	0%
Dietary fibre, total	1.7 g	6%
Sodium	4 mg	0%
Vitamins		
Biotin (B7)	24 µg	81% ESADDI
Niacin (B3[a])	6.7 mg	67% RDI
Pantothenic acid (B5)	1.8 mg	35% ESADDI
Riboflavin (B2[a])	0.6 mg	33% RDI
Vitamin B6	0.3 mg	21% RDI
Minerals		
Copper	0.3 mg	11% ESADDI
Phosphorus	104 mg	10% RDI
Potassium	375 mg	[b]
Selenium	26 µg	36% RDI

note there is no labelling RDI for potassium but a claim can be made if a serve contains >200 mg per serve

Example of a standard NIP for Portabello mushrooms:

NUTRITION INFORMATION

Servings per package: 2.5
Serving size: 100 g

	Quantity per 100 g Serving	% Daily intake per serve
Energy	65 kJ	1%
Protein	2.1 g	4%
Fat, total	0.4 g	1%
– saturated	0 g	0%
Carbohydrate	0 g	0%
- sugars	0 g	0%
Dietary fibre, total	1.8 g	6%
Sodium	4 mg	0%
Vitamins		
Biotin (B7)	31 µg	102% ESADDI
Niacin (vitamin B3[a])	6.1 mg	61% RDI
Pantothenic acid	1.4 mg	27% ESADDI
Riboflavin (vitamin B2[a])	0.5 mg	29% RDI
Vitamin B6	0.3 mg	19% RDI
Minerals		
Copper	0.3 mg	11% ESADDI
Phosphorus	109 mg	11% RDI
Potassium	385 mg	[b]
Selenium	23 µg	33% RDI

note there is no labelling RDI for potassium but a claim can be made if a serve contains >200 mg per serve

Based on the data gathered here, there are numerous claims that can be made for Meadow Mushrooms. The claims that can be made are the same for both white button and Portabello mushrooms. Under Standard 1.2.7 the following general claims can be made for mushrooms:

- Mushrooms are a low energy food.
- Mushrooms are a low fat food.
- Mushrooms are a low salt/sodium food. This statement can be linked to the following high level health claim: A diet low in salt or sodium reduces blood pressure.
- Mushrooms are a good source of biotin, niacin, pantothenic acid, riboflavin and selenium (i.e. contain 25% or greater of the RDI/ESADDI).
- Mushrooms are a source of vitamin B6, copper and phosphorous (i.e. contain 10% or greater of the RDI/ESADDI).

In addition there are numerous general level health claims that can be linked to the content of these vitamins and minerals. These claims will be specific to mushrooms grown by Meadow Mushrooms as factors such as growing conditions can influence nutritional composition and without complete analysis mushrooms from other sources may not reach target levels for claims.

A preliminary investigation of the vitamin D level in the Meadow Mushrooms showed there was detectable vitamin D present. However, the form of vitamin D reported by the analytical laboratory was not in agreement with literature reports. It appears there is a question over the analytical method used for vitamin D by the key New Zealand analytical laboratory (this may be a unique issue for mushrooms because they have different forms to most foods and the vitamin D form added to foods). Until this is resolved and verified techniques are developed, content levels cannot be established with any confidence, and so claims cannot be made.

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1 INTRODUCTION

It is important to be able to accurately document the nutritional value of any food product, so that it can be made available to customers and consumers. Although not mandatory on fresh produce, it can be useful to provide this information in a nutrition information panel (NIP) on pack and/or website. Nutrition information can also provide the data to enable health claims to be made. Food Standards Australia New Zealand (FSANZ) sets standards for what information must and can be used on food labels. There are two key standards that are relevant for making nutrition claims: standards 1.2.8 (Nutrition Information Requirements) and 1.2.7 (Nutrition content claims and health claims). FSANZ Standard 1.2.7 came into force in January 2013 and allows an extended range of preapproved general level health claims on pack as long as certain criteria are met.

The aim of this project was to gather compositional information for both white button and Portabello mushrooms to use for labelling and promotional purposes. Currently, the basic nutritional data available to Meadow Mushrooms is inconsistent so there are questions over what values should be used. There are a number of reasons for differences. Firstly, there may be variation in nutritional content depending on factors influencing the mushrooms themselves (e.g. way in which they are grown, maturity, storage, etc).

In addition to the basic NIP, other components such as vitamins and minerals can be added, and it is essential these are included if claims (e.g. mushrooms are a good source of niacin) are to be made. If a serving of mushrooms contains over 10% of the recommended dietary intake (RDI) or estimated safe and adequate daily dietary intake (ESADDI) of a vitamin or mineral then it can be classed as a “source” of that component. If the level is over 25% RDI or ESADDI then it can be classed as a “good source”.

In addition to vitamins and minerals there are other components in mushrooms that may be responsible for the health benefits. Antioxidants have attracted considerable attention and are often used for promotion. This has been a controversial area and European legislation has largely banned use of antioxidant promotion. In New Zealand antioxidant claims can be made based on the antioxidant vitamins (vitamins C and E). Unfortunately, mushrooms contain neither vitamin C nor E in significant quantities and so a claim could not be made. Mushrooms do contain ergothionenine, which has been shown to act as an antioxidant in vitro (Dubost et al. 2007). However, ergothionenine does not have a RDI and hence the only statement that can be made is that “mushrooms contain ergothionenine”. No reference can be made to its function as an antioxidant under existing New Zealand food labelling legislation. It is also questionable if the term ergothionenine would resonate with consumers. Hence there seems to be limited value in measuring at this time.

Vitamin D-enhanced mushrooms are now a commercial product line sold throughout the world. Small quantities of vitamin D are present in mushrooms naturally and the level may depend on how they are grown (Mattila et al. 2002; Koyyalamudi et al. 2009). Vitamin D is synthesized in mushrooms following exposure to UV light, and research has led to the development of a specialized machine for use with mushrooms. This project has included analysis of vitamin D in the nutritional analysis to get baseline levels. At a later point this work could always be expanded upon.

In terms of this study, the best approach decided was to analyse samples as would be purchased by the consumer. By sampling from various locations and batches, this will eliminate

some variables. The samples analysed should be representative of the conditions under which Meadow Mushrooms are typically grown. The data contained in this report will be specific to mushrooms grown by Meadow Mushrooms as factors such as growing conditions can influence nutritional composition.

2 METHODS

2.1 Sample sourcing and preparation

2.1.1 Procurement of samples

Samples of both white button and Portabello mushrooms grown by Meadow Mushrooms were purchased from three different supermarkets in Christchurch, one in Palmerston North and one in Auckland. Both pre-packed and loose mushrooms were purchased, ensuring that all were Meadow Mushrooms. The exception to this was that loose mushrooms were not purchased in Palmerston North due to potential mixing of samples from other suppliers. Samples were then combined into one pool for each mushroom type (button or Portabello). From each pool of mushrooms, two separate samples were taken (resulting in a total of four samples).
All analyses were then carried out in duplicate for each sample.

Figure 1. Mushrooms sampled for this project.

2.1.2 Sample preparation for analysis

Mushrooms were brushed lightly to remove any residual particulate material and the bottom of the stem trimmed as necessary (only the minimum was removed). The samples were then processed in a food processor to obtain a homogeneous sample and frozen until analysis.

2.2 Analysis

The following analysis methods were used (these are standard methods for the New Zealand Food Composition Database and approved for food labelling purposes). Analysis was conducted at approved laboratories used for database purposes.

- Proximates:
  - Total nitrogen: AOAC (Association of Analytical Communities) method; protein levels were determined by multiplication of total nitrogen levels by the standard conversion factor (6.25).
  - Fat: Soxhlet extraction
  - Sugars: gas-liquid chromatography (GLC)
  - Starch: Boehringer Mannheim “Methods of biochemical analysis and food analysis”
  - Fibre: Enzymatic-gravimetric method, AOAC 991.43
  - The following analyses were also conducted to allow calculation of results:
  - Moisture: oven drying AOAC method
  - Ash: Gravimetric method
- Elements:
  - Copper Biological materials digestion, Inductively coupled plasma mass spectrometry (ICP-MS)
  - Phosphorus Biological materials digestion, inductively coupled plasma optical emission spectrometry (ICP-OES)
  - Potassium Biological materials digestion, ICP-OES
  - Selenium TMAH digestion, ICP-MS
  - Sodium Biological materials digestion, ICP-OES
  - Zinc: Biological materials digestion, ICP-MS
- Vitamins:
  - Biotin: Biacore
  - Folate: Microbiological method
  - Pantothenic acid: GC method
  - Vitamin B2 (riboflavin): HPLC method
  - Vitamin B3 (niacin): HPLC method
  - Vitamin B6 (total): HPLC method
  - Vitamin C: HPLC method
  - Vitamin D: HPLC method

3 RESULTS AND DISCUSSION

3.1 Proximate

The proximate composition of the two mushroom types is given in Table 1. Values for the two separate samples taken for each sample type were very consistent, indicating they are a good representation of typical mushrooms as supplied by Meadow Mushrooms. In general these results reported here are reasonably consistent with previously published data. With the exception of protein, white button and Portabello mushrooms were very similar in composition.

- Energy: Energy values are in the range of previously reported data. Differences in energy values compared to existing database values can largely be explained by the way carbohydrate data are used and or calculated. Because there appears to be a component of carbohydrate that is not quantified, there is a significant difference between energy calculated using available carbohydrate by difference and by summation. Under New Zealand food labelling regulations either value can be used. Either way a claim can be made that mushrooms are a low energy food. The energy value using total carbohydrate by difference is not generally used for labelling and is included below for comparative purposes with existing database values.
- Protein: The amount of protein noted in this study is in the range of that previously reported. The same trend was observed as in the USDA database with Portabello mushrooms having a lower protein content than the white button mushrooms. No claim can be made with regards to protein content. Under Standard 1.2.7 a food must contain a minimum of 5 g of protein per serve to make a claim.
- Fat: As expected, the fat levels in both mushroom types is low with no detectable saturated fat. This is in line with previously published data. As a result, the claim can be made that they are low in fat.
- Carbohydrate: This is one area where there is considerable variation in published data. In this study sugars and starch were below the level of detection. This is in agreement with most data where no starch is reported and only minimal sugar. It is only the USDA database that reports significant sugars and this is in disagreement with the literature as well. There appear to be some issues with quantification of sugars and sugar alcohols in many studies. In addition to the standard sugars (sucrose, lactose, maltose, fructose, glucose), the analysis conducted here looked for mannitol, sorbitol and glycerol. None of these were detected but an unidentified peak was reported. Because of these difficulties, many studies report carbohydrate by difference.
- Fibre: Fibre levels were very similar for the white button and Portabello mushrooms, and were in the range of previously reported data. The level of fibre is too low to make a claim. Under Standard 1.2.7 a serving of the food must contain at least 2 g of dietary fibre per serve unless the claim is about low or reduced dietary fibre.

Table 1. Proximate composition of Meadow Mushrooms white button and Portabello mushrooms, analysed raw.

		White button		Portabello	
Core Nutrients	units	Average	SD	Average	SD
Energy[a]	kJ	78	2	65	1
Energy[b]	kJ	140	2	133	4
Energy[c]	kJ	124	2	116	3
Protein	g	2.8	0.1	2.1	0.1
Fat, total	g	0.5	0	0.4	0
Fat, saturated	g	0	0	0	0
Total carbohydrate (by difference)[d]	g	4.4	0.1	4.8	0.1
Available carbohydrate (by difference)[e]	g	2.7	0.0	3.0	0.2
Available carbohydrate (by summation)[f]	g	<0.1	-	<0.1	-
Sugars	g	<0.1	-	<0.1	-
Starch	g	<0.1	-	<0.1	-
Fibre	g	1.7	0.1	1.8	0.1
Moisture	g	91.4	0.1	91.8	0.2
Ash	g	1.0	0.0	0.9	0.0

[a] Calculated using the available carbohydrate by summation and the fibre factor as used for New Zealand NIPs

[b] Calculated using the total carbohydrate by difference and not factoring in fibre (this is the way is reported in some databases). Note this value should not be used for labelling purposes in New Zealand and is only included for comparison with other published data.

[c] Calculated using the available carbohydrate by difference and the fibre factor

[d] Calculated by subtracting from 100, the average quantity expressed as a percentage of water, protein, fat and ash

[e] Calculated by subtracting from 100, the average quantity expressed as a percentage of water, protein, fat, fibre and ash

[f] Sum of sugars plus starch

3.2 Vitamins

The concentrations of selected vitamins measured are shown in Table 2. The duplicate samples for each mushroom type showed good agreement, reinforcing that the values represent typical concentrations.

- Biotin: The concentrations of biotin were high in both mushroom types with the Portabello having slightly higher levels. These concentrations are higher than have been reported previously. The reason for this is unclear. Because of the high concentrations, good source claims can be made for both mushroom types.
- Folate: Concentrations were slightly higher in Portabello than white button mushrooms. The values were in the range previously reported and very similar to other New Zealand data. However, the concentrations are below that for which a content claim can be made (<10% RDI).
- Niacin (vitamin B3): Like biotin, concentrations of this B vitamin were at the top end of what has previously been reported. The trend was also observed that white button had higher levels than the Portabello. Good source claims can be made for both mushroom types.
- Pantothenic acid: For this vitamin, levels were higher in the white buttons compared to the Portabello. Both were in the range previously reported and are high enough to make good source claims.
- Riboflavin (vitamin B2): As with some of the other B vitamins, concentrations were at the top end of what has previously been reported. Values were slightly higher for white buttons compared to Portabello. For both types the concentration is high enough to make good source claims.
- Vitamin B6: Concentrations were similar for both mushroom types and within the range previously reported. Concentrations are high enough to make source claims.
- Vitamin C: The concentration of vitamin C was below the level of detection in both the button and Portabello mushrooms. This is in agreement with the databases and most of the literature. There are a few reports of significant levels of vitamin C in mushrooms but these are definitely exceptions. Because of the low levels (<10% RDI), no claim can be made for vitamin C
- Vitamin D: These results are unexpected with a large amount of vitamin D3 (cholecalciferol) and vitamin D2 (ergocalciferol) being below the level of detection. According to the literature and the USDA database, mushrooms should contain only ergocalciferol. This is formed from ergosterol. The reasons for the unexpected result may be analytical issues. The Australian nutrient database (Food Standards Australia New Zealand NUTTAB 2010) notes that for vitamin D there are concerns about the currently available analytical methods and results. However, they do not report any data for mushrooms. It would appear the method used here is similar. A recent paper also notes there is an additional vitamin D in mushrooms – vitamin D4 (Phillips et al. 2012). In order to resolve the exact vitamin D composition of mushrooms, it will be necessary to explore other analytical methods. Liquid chromatography–mass spectrometry (LC-MS) will allow us to confirm structure of the compounds present. No claims can be made until these analytical issues are resolved.

In summary, claims can be made for Meadow Mushrooms for biotin, niacin, pantothenic acid, riboflavin and vitamin B6.

Table 2. Concentrations of selected vitamins in Meadow Mushrooms white button and Portabello mushrooms, analysed raw.

		White button		Portabello	
Vitamins	units	Average	SD	Average	SD
Biotin	µg	24.4	1.3	30.5	4.1
Folate	µg	14	1	19	3
Niacin (vitamin B3)	mg	6.73	0.40	6.14	0.23
Pantothenic acid	mg	1.75	0.07	1.35	0.07
Riboflavin (vitamin B2)	mg	0.56	0	0.50	0.06
Vitamin B6	mg	0.34	0.05	0.30	0.01
Vitamin C	mg	<1	-	<1	-
Vitamin D2	iu	<20	-	<20	-
Vitamin D3	iu	111	27	336	84
Vitamin D – total	iu	111	27	336	84
Vitamin D – total	µg	2.8	0.7	8.4	2.1

3.3 Minerals

The average mineral concentrations in the mushroom samples are given in Table 3. For both white button and Portabello mushrooms, the two separate samples taken were close in concentrations of the selected minerals measured. The white button and Portabello mushrooms were also quite similar in composition.

- Copper: Concentrations were identical for the button and Portabello mushrooms at 0.33 mg per 100 g. This is very much in agreement with previously published data from food composition databases. This level is high enough to allow a source claim to be made.
- Phosphorus: Concentrations were very similar for button and Portabello mushrooms, and in agreement with previous data. This level is high enough to allow a source claim to be made.
- Potassium: The concentrations were also similar for both types of mushroom and in agreement with previous data. This level will allow claims to be made.
- Selenium: These are probably the most significant results for the minerals because selenium is often low in New Zealand-grown produce. Both the button and Portabello mushrooms had similar levels. Both these values are higher than the current level in the New Zealand Food Composition Database although a little lower than our 2003 data. The values are in the range reported in the wider literature. This level is high enough to allow a good source claim to be made.

- Sodium: As expected, concentrations were low and are consistent with previous results. This was measured as it is a requirement for a NIP. It will also allow a low sodium claim to be made if desired.
- Zinc: Concentrations were lower in Portabello than button mushrooms and were similar to previous results. Zinc was measured because a couple of reports showed it may achieve levels bordering on that allowed to make a claim. However, the level of zinc measured in this study is too low to allow a content or health claim to be made for either mushroom type.

In summary, for the minerals, claims can be made for Meadow Mushrooms for copper, phosphorus, potassium and selenium. In addition claims can be made for low sodium.

Table 3. Concentrations of selected minerals in Meadow Mushrooms button and Portabello mushrooms.

		White button		Portabello	
Minerals	units	Average	SD	Average	SD
Copper	mg	0.33	0.02	0.33	0.05
Phosphorus	mg	104	4	109	4
Potassium	mg	375	21	385	7
Selenium	µg	25.5	0.7	23	1
Sodium	mg	3.7	0.4	3.9	0.1
Zinc	mg	0.54	0.07	0.47	0.05

4 CLAIMS

Based on the data gathered here, there are numerous claims that can be made for mushrooms grown by Meadow Mushrooms. These claims may not necessarily apply to other mushrooms as factors such as growing conditions can influence nutritional composition and without complete analysis mushrooms from other sources may not reach target levels for claims.The claims that can be made are the same for both white button and Portabello mushrooms. Under Standard 1.2.7 the following general claims can be made for mushrooms:

- Mushrooms are a low energy food (a food can claim to be a low energy food if the energy content is <170 kJ per 100 g).
- Mushrooms are a low fat food (the food contains no more fat than 3 g per 100 g for solid food).
- Saturated fat free (the food contains no detectable saturated fatty acids; and the food contains no detectable trans fatty acids).[1]
- Mushrooms are a low salt/sodium food (the food contains no more sodium than 120 mg per 100 g for solid food). This statement can be linked to the following high level health claim: A diet low in salt or sodium reduces blood pressure.

In addition there are a number of claims that can be made for the vitamins and minerals (these are summarised in Table 4). These claims are based on a serving size of 100 g.

- Vitamins:
  - Mushrooms are a good source of biotin, niacin, pantothenic acid and riboflavin (these vitamins are present at 25% or greater of the RDI).
  - Mushrooms are a source of vitamin B6 (this vitamin is present at 10% or greater but less than 25% RDI).
- Minerals:
  - Mushrooms are a good source of selenium (this mineral is present at 25% or greater of the RDI)
  - Mushrooms are a source of copper and phosphorous (these minerals are present at 10% or greater but less than 25% RDI). Potassium is slightly different in that there is no published RDI for labelling purposes but as long as a serve contains 200 mg, the general level claims can be made.

In addition there are general level health claims that can be linked to the content of these vitamins and minerals (Table 4). These claims must be clearly linked to the vitamin or mineral. Some also have to mention the specific subgroup of the population they are relevant to (i.e. children). This list is large and will be too much to include on pack so it is probably desirable to choose one or two things to focus on (there are some common claims that appear for several different nutrients). More detail can appear on the website and other relevant promotional material. The exact wording below does not have to be followed (it can be made more

[1] This statement can be linked to the following high level health claim: A diet low in saturated fatty acids reduces total blood cholesterol or blood LDL cholesterol. However, it may not be worth doing this as will have to add other fatty acid composition to label and the positive elements are more important.

consumer friendly) as long as the meaning remains. One important fact is that claims must refer to supporting normal function; they must not refer to boosting or enhancing function.

Table 4. Vitamin and mineral claims that could be made for mushrooms.

Component	RDI/ESADDI for labelling purposes	RDI & Content claim permissible for mushrooms based on 100 g serving size	General level health Claims
Biotin	30 µg	White button: 81% ESADDI Portabello: 102% ESADDI Good source	Contributes to normal fat metabolism and energy production
			Contributes to normal functioning of the nervous system
			Contributes to normal macronutrient metabolism
			Contributes to normal psychological function
			Contributes to maintenance of normal hair
			Contributes to maintenance of normal skin and mucous membranes
Copper	3 mg	White button: 11% ESADDI Portabello: 11% ESADDI Source	Contributes to normal connective tissue structure
			Contributes to normal iron transport and metabolism
			Contributes to cell protection from free radical damage
			Necessary for normal energy production
			Necessary for normal neurological function
			Necessary for normal immune system function
			Necessary for normal skin and hair colouration
			Contributes to normal growth and development (children)
Niacin	10 mg	White button: 67% RDI Portabello: 61% RDI Good source	Necessary for normal neurological function
			Necessary for normal energy release from food
			Necessary for normal structure and function of skin and mucous membranes
			Contributes to normal growth and development (children)
			Contributes to normal psychological function

Component	RDI/ESADDI for labelling purposes	RDI & Content claim permissible for mushrooms based on 100 g serving size	General level health Claims
			Contributes to the reduction of tiredness and fatigue
Pantothenic acid	5 mg	White button: 35% ESADDI Portabello: 27% ESADDI Good source	Necessary for normal fat metabolism
			Contributes to normal growth and development (children)
			Contributes to normal energy production
			Contributes to normal mental performance
			Contributes to normal synthesis and metabolism of steroid hormones, vitamin D and some neurotransmitters
			Contributes to the reduction of tiredness and fatigue
Phosphorus	100 mg	White button: 10% RDI Portabello: 11% RDI Source	Necessary for normal teeth and bone structure
			Necessary for the normal cell membrane structure
			Necessary for normal energy metabolism
			Contributes to normal growth and development(children)
Potassium	No RDI for labelling but health claims allowed at 200 mg/serve	Contains	Necessary for normal water and electrolyte balance
			Contributes to normal growth and development (children)
			Contributes to normal functioning of the nervous system
			Contributes to normal muscle function
Riboflavin	1.7 mg	White button: 33% RDI Portabello: 29% RDI Good source	Contributes to normal iron transport and metabolism
			Contributes to normal energy release from food
			Contributes to normal skin and mucous membrane structure and function
			Contributes to normal growth and development (children)
			Contributes to normal functioning of the nervous system
			Contributes to the maintenance of normal red blood cells

Component	RDI/ESADDI for labelling purposes	RDI & Content claim permissible for mushrooms based on 100 g serving size	General level health Claims
			Contributes to the maintenance of normal vision
			Contributes to the protection of cells from oxidative stress
			Contributes to the reduction of tiredness and fatigue
Selenium	70 µg	White button: 36% RDI Portabello: 33% RDI Good source	Necessary for normal immune system function
			Necessary for the normal utilization of iodine in the production of thyroid hormones
			Necessary for cell protection from some types of free radical damage
			Contributes to normal sperm production
			Contributes to the maintenance of normal hair and nails
			Contributes to normal growth and development (children)
Vitamin B6	1.6 mg	White button: 21% RDI Portabello: 19% RDI Source	Necessary for normal protein metabolism
			Necessary for normal iron transport and metabolism
			Contributes to normal growth and development (children)
			Contributes to normal cysteine synthesis
			Contributes to normal energy metabolism
			Contributes to normal functioning of the nervous system
			Contributes to normal homocysteine metabolism
			Contributes to normal glycogen metabolism
			Contributes to normal psychological function
			Contributes to normal red blood cell formation

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