



Vitaminer og mineraler ved plantebaseret kost

Anbefalinger til voksne

v.

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Indhold

- ❁ Indtag og status
- ❁ Hvilke næringsstoffer kræver særlig opmærksomhed
 - ❁ Anbefaling og kilder i kosten
- ❁ Biotilgængelighed

Nutrient intake and health status of vegans.

Chemical analyses of diets using the duplicate portion sampling technique¹⁻³

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ABSTRACT A strict vegetarian diet [vegan diet (VD)] was investigated. Six middle-aged vegans (three men and three women) collected copies of 24-h diets using the duplicate portion sampling technique. By chemical analyses, the nutrient composition was determined in detail and compared with corresponding figures of a normal mixed Swedish diet. In the VD 30% of the energy originated from fat compared with 40% in normal Swedish mixed diet (MD). Linoleic acid was the dominant fatty acid (60% of total fat in VD versus 8% in MD). The VD contained 24 g protein/1000 kcal compared to 30 g/1000 kcal in MD, but the intake of essential amino acids by the vegans exceeded the recommendations. Dietary fiber was about 5 times higher in the vegan diet (29 versus 6 g/1000 kcal) and sucrose similar to MD (18 versus 21 g/1000 kcal). Among the inorganic nutrients the concentration of calcium (351 versus 391 mg/1000 kcal) and sodium (53 versus 49 mmol/1000 kcal) were similar in both types of diets but the amount of potassium (56 versus 30 mmol/1000 kcal, magnesium (300 versus 110 mg/1000 kcal), iron (9 versus 6.5 mg/1000 kcal), zinc (6.5 versus 4.7 mg/1000 kcal), and copper (2 versus 0.7 mg/1000 kcal) were nearly doubled. Iodine (39 versus 156 µg/1000 kcal and selenium (5 versus 17 µg/1000 kcal) were much lower in the VD. Selenium even being undetectable in several 24-h diets. The VD was rich in folic acid (301 versus 90 µg/1000 kcal in MD) but the intake of vitamin B₁₂ was only 0.3 to 0.4 µg/day (MD: 3 to 4 µg/day). No clinical signs of nutritional deficiency were observed in the vegans. Serum protein levels of the vegans as well as their serum lipoproteins were near the lower range of the reference group. In addition, none of the vegans was overweight and their blood pressures were low for their age. *Am. J. Clin. Nutr.* 34: 2464-2477, 1981.

Lund, Sverige: 6 veganere (3 K, 3 M – 49-55 år)
4x 24 h dobbeltportionsmetode, vs standard svensk kost
Resultaterne opgjort som indtag per 1000 kcal:

Calcium:	351 vs. 391
Jern:	9 vs. 6,5
Zink:	6,5 vs. 4,7
Selen:	5 vs. 17
Iod:	39 vs 156

Nutrient intake and vitamin status of healthy French vegetarians and nonvegetarians¹⁻³

Pascal Millet, Jean C Guillard, Françoise Fuchs, and Jacques Klepping

ABSTRACT The status of thiamin, riboflavin, folate, and vitamins B-6, B-12, C, A, D, and E was investigated in 37 middle-aged and healthy French vegetarians by means of a dietary survey and biochemical studies. Values were compared with those of a group of nonvegetarians. Unsatisfactory intakes of vitamin B-6 were observed: vitamin B-6 intake as a percentage of the French Recommended Dietary Allowances was ~66% for vegetarians and ~58% for nonvegetarians. Vegetarians had a higher mean intake of thiamin, riboflavin, and vitamins C, A, D, and E than did nonvegetarians. Vegetarians did not have a higher risk rate for a biochemical vitamin deficiency of thiamin, riboflavin, folates, and vitamins B-6, C, A, and E than the nonvegetarians. The percentage of subjects assessed as abnormal by blood vitamin concentrations was higher in vegetarians for vitamin B-12 (serum vitamin B-12) and vitamin D, which indicated a higher risk for a deficiency of vitamins B-12 and D in this group. *Am J Clin Nutr* 1989;50:718-27.

KEY WORDS Biochemical assay, nutrient intakes, vitamin status, dietary interrelationships, vegetarians, nonvegetarians

37 franske **vegetarer** - heraf 3 veganere (26 K, 11 M)
sammenlignet med 69 ikke-vegetarer.
7-dages vejet kostdagbog

RESEARCH ARTICLE

Food and Nutrient Intake and Nutritional Status of Finnish Vegans and Non-Vegetarians

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22 Finske veganere (16 K, 6M) vs. 19 omnivore

3 dages estimeret kostdagbog

"the vegans obtained less, saturated fat, cholesterol, niacin, selenium, vitamin D, and vitamin B12 ($p < 0.001$)"

"The vegans exhibited lower serum concentrations of vitamin B12, vitamin D (25-hydroxyvitamin D2 and D3) total cholesterol and LDL cholesterol, as well as plasma concentrations of selenium, β -carotene, and α -tocopherol"

"All vegan subjects and 91% of the non-vegetarian subjects had iodine concentrations lower than the WHO's limit for mild iodine deficiency ($< 100 \mu\text{g/L}$ urine)."

RESEARCH

Open Access



Intake of macro- and micronutrients in Danish vegans

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Abstract

Background: Since information about macro- and micronutrient intake among vegans is limited we aimed to determine and evaluate their dietary and supplementary intake.

Methods: Seventy 18–61 years old Danish vegans completed a four-day weighed food record from which their daily intake of macro- and micronutrients was assessed and subsequently compared to an age-range-matched group of 1 257 omnivorous individuals from the general Danish population. Moreover, the vegan dietary and supplementary intake was compared to the 2012 Nordic Nutrition Recommendations (NNR).

Results: Dietary intake differed significantly between vegans and the general Danish population in all measured macro- and micronutrients ($p < 0.05$), except for energy intake among women and intake of carbohydrates among men. For vegans the intake of macro- and micronutrients (including supplements) did not reach the NNR for protein, vitamin D, iodine and selenium. Among vegan women vitamin A intake also failed to reach the

70 danske veganer (18-61 år), sammenlignet med matchet ikke-vegansk kontrolgruppe. 4 dages vejet kostdagbog

"Vegans did not reach the NNR for protein, vitamin D, iodine and selenium. Among vegan women vitamin A intake also failed to reach the recommendations."

"It is a potential limitation that a vegan diet is non-conventional and some of the recorded meals or food items were unavailable in the database. "

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Original Research

High compliance with dietary recommendations in a cohort of meat eaters, fish eaters, vegetarians, and vegans: results from the European Prospective Investigation into Cancer and Nutrition–Oxford study☆☆☆



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803 veganere, foodfrequency

"Vegans had the highest intakes of polyunsaturated fatty acids, dietary fiber, vitamins C and E, folate, magnesium, iron, and copper."

"The results suggested a high prevalence of inadequacy for dietary vitamin B12 and iodine in vegans." Supplements not calculated.

Veganer har laveste indtag af calcium, zink og vitamin A

Hvor kommer mineraler og vitaminer fra?



Calcium

NNR 2012 anbefalinger:

Calcium mg/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y
Recommended intake	RI	800	800	600	700	900
Average requirement	AR	500	500			
Lower intake level	LI	400	400			
Upper intake level	UL	2,500*	2,500*			

* EFSA 2012.

Fødevarestyrelsen:

“Hvis du er i tvivl om, hvorvidt du får dækket dit behov for calcium, kan du vælge at tage et kosttilskud.”

<https://altomkost.dk/raad-og-anbefalinger/saerlige-grupper/vegetarer-og-veganere/raad-om-vitaminer-mineraler-og-kosttilskud-voksne/>

Kilder til calcium

- ❁ Lav oxalat, 40-60 % absorption: Broccoli, bok choy, grønkål (219), kinakål, brøndkarse, bladkål
 - ❁ Høj oxalat, 5 % absorption: spiant (129), bladbede/sølvbede, rødbede-toppe
- ❁ Beriget plantemælk/-yoghurt (120) eller tofu: 30-32 % absorption
- ❁ Tahini (sesamfrø - 959), bælgrugter (soja - 163), ca. 20 % absorption
- ❁ Mandler (256): 14-21 % absorption
- ❁ Desuden hørfrø (201), figner (193), havregryn (53)
- ❁ OBS højt saltindtag kan medføre øget tab af calcium igennem urinen

Jern

NNR 2012 anbefalinger:

Iron mg/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y
Recommended intake	RI	15 / 9 ¹	9	8	9	11
Average requirement	AR	10 / 6 ¹	7			
Lower intake level	LI	5 ¹	7			
Upper intake level	UL	60	60			

¹ post menopause.

Amerikanske Institue of Medicine (IOM) har tidligere (2001) anbefalet op til 1,8 x mere jern til veganere og vegetarer.

Fødevarestyrelsen:

“Hvis du er i tvivl om, hvorvidt du får dækket dit behov for jern, kan du vælge at tage et kosttilskud.”

Absorption

- ❁ Jern i planter kaldes non-hæm jern, absorberes ikke så let som hæm-jern fra animalske kilder.
- ❁ Tillader fleksibelt optag afhængig af kroppens reserver.
- ❁ Absorption fremmes ved tilstedeværelse af vitamin C, citronsyre, beta-caroten, løg og hvidløg
- ❁ Absorption hæmmes af tanniner og polyphenoler i sort te, kaffe, rødvin. Desuden calcium.
- ❁ For meget jern kan give oxidativt stress og er blevet associeret til øget risiko for udvikling af alzheimers, parkinsons, type 2-diabetes og hjerte-kar-sygdom
- ❁ Jern-mangel anæmi er ikke hyppigere forekommende hos veganere og vegetarianer end ikke-vegetarer.

Kilder til jern

- ❁ Bælgrugter: Soya (15,7), linser 6,5), kikaerter (6,4), hvide bønner (5,5)
- ❁ Frø: sesam- (14,6), hør-(14,6), græskar-(8,8) og solsikkefrø (5)
- ❁ Kakao (11)
- ❁ Soltørret tomat (9,1), spinat (4,5)
- ❁ Tørret frugt: fersken (6,8), abrikos (6)
- ❁ Cashewnødder (6), pinjekerner (5,5), mandel (4,5)

Zink

NNR 2012 anbefalinger:

Zinc mg/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y girls/boys
Recommended intake	RI	7	9	6	7	8/11
Average requirement	AR	5	6			
Lower intake level	LI	4	5			
Upper intake level	UL	–	–			

Fødevarestyrelsen:

“Hvis du er i tvivl om, hvorvidt du får dækket dit behov for zink, kan du vælge at tage et kosttilskud.”

Kilder til zink

- ❁ Frø: Chia- (4,58), pinje- (6,45), sesam- (7,75), hør- (7,75), græskar- (7,81) og birkesfrø (10,2)
- ❁ Kakao (10,1)
- ❁ Daddel, tørret (5,1)
- ❁ Nødder: Cashewnød (5,6), pecan- (5,07), para- (4,2), mandel (3,3)
- ❁ Gule (flæk)ærter (3,8)
- ❁ Hirse (3,4)

- ❁ Optageligheden øges ved fermentering, iblødsætning, spiring, langtidshævnning, tilsætning af hvidløg
- ❁ Absorptionen øges hvis under graviditet og ved lave depoter

Iod

NNR 2012 anbefalinger:

Iodine µg/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y
Recommended intake	RI	150	150	90	150	120
Average requirement	AR	100	100			
Lower intake level	LI	70	70			
Upper intake level	UL	600	600			

Fødevarestyrelsen:

"Hvis du er i tvivl om, hvorvidt du får dækket dit behov for iod, kan du vælge at tage et kosttilskud."

Academy of Nutrition and dietetics:

"Vegan women of child-bearing age should supplement with 150 mg/day iodine"

Iod – det oversete mineral i plantebaseret kost

- ❁ Næsten alle undersøgelser har vist lavt iodindtag hos veganere.
- ❁ Kun HVIS der er iod-mangel, så kan goitrogene fødevarer som soja, sød kartoffel, hørfrø, broccoli, rosenkål, blomkål, grønkål, kålrabi, være med til fremkalde struma.
- ❁ Fermentering kan fjerne den goitrogene effekt.

Kilder til iod

- ❁ Iodberiget salt.... 1 g salt indeholder 13 mikrogram iod.
- ❁ Tang – OBS indholdet kan være meget højt i visse typer (arame, wakame, kombu, fingertang og sukkertang), derfor anbefaler Fødevarestyrelsen, at de ikke spises mere end 1x uge. Nori tang der bruges til Sushi har dog forholdsvis lavt indhold, OK på daglig basis.

Selen

NNR 2012 anbefalinger:

Selenium µg/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y
Recommended intake	RI	50	60	25	30	40
Average requirement	AR	30	35			
Lower intake level	LI	20	20			
Upper intake level	UL	300	300			

Fødevarestyrelsen:

“Hvis du er i tvivl om, hvorvidt du får dækket dit behov for selen, kan du vælge at tage et kosttilskud.”

Kilder til selen

- ❁ Selenindholdet i jorden varierer enormt i forskellige dele af verden. Fx meget lavt i Sverige og kan være enormt højt visse steder i USA.
- ❁ Korn og produkter heraf, nødder, frø – afhænger af dyrkningsforholdene. Råd: Spis varieret!!!!

Vitamin A

NNR 2012 anbefalinger:

Vitamin A RE/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y
Recommended intake	RI	700	900	350	400	600
Average requirement	AR	500	600			
Lower intake level	LI	400	500			
Upper intake level	UL	3,000* 1,500*#				

* as preformed retinol.

Post-menopausal women.

Fødevarestyrelsen:

“Hvis du er i tvivl om, hvorvidt du får dækket dit behov for vitamin A, kan du vælge at tage et kosttilskud.”

Kilder til vitamin A (carotenoider)

- ❁ Gul-orange frugt og grønt: gulerødder, abrikos, mango, cantaloupe melon, nektariner, papaya, græskar, squash, søde kartofler, tomater
- ❁ Grønne grøntsager: broccoli, grønne bladgrøntsager, grønkål
- ❁ Varmetilberedning kan lette absorptionen af nogle carotenoidformer, fx lycopren i tomater
- ❁ Fedtopløseligt, så samtidig indtag af fedtstof hjælper ligeledes absorptionen

Riboflavin, vitamin B2

NNR 2012 anbefalinger:

Riboflavin, mg/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y girls/boys
Recommended intake	RI	1.3	1.7	0.7	1.1	1.2/1.4
Average requirement	AR	1.1	1.4			
Lower intake level	LI	0.8	0.8			
Upper intake level	UL	– *	– *			

* Not established.

Fødevarestyrelsen:

“Hvis du er i tvivl om, hvorvidt du får dækket dit behov for riboflavin, kan du vælge at tage et kosttilskud.”

Kilder til riboflavin

- ❁ Sojabønner, tørrede (0,87)
- ❁ Gærflager (4)
- ❁ Mandler (0,8), hampefrø (0,28), sesam- og hørfrø (0,25)
- ❁ Grønkål (0,29), champignon (0,44), soltørret tomat (0,49)
- ❁ Quinoa (0,25), hirse (0,29), grahamsknækbrød (0,3)

Vitamin D

NNR 2012 anbefalinger:

Vitamin D µg/d		Women	Men
Recommended intake	RI		
2–60 years		10	10
61–74 years		10	10
≥ 75 years		20	20
Average requirement	AR	7.5	7.5
Lower intake level	LI	2.5	2.5
Upper intake level	UL	100*	100*

* IoM 2010; EFSA 2012.



Fødevarestyrelsen:

"Hvis du er veganer, anbefaler Fødevarestyrelsen, at du tager et tilskud på 10 µg vitamin D pr. dag om vinteren fra oktober til april. Dette kan ligeledes være nødvendigt, hvis du som vegetar kun spiser sparsomt med æg og mælkeprodukter.

Vitamin D

- ❁ D-2 ergocalciferol, kan fås fra svampe der har fået UVB stråling
- ❁ D-3 cholecalciferol, traditionelt fra animalsk kilde, men nu fås vegansk D-3, fra lav
- ❁ I lave doser ser Vit. D-2 og D-3 ud til at have sammen effektivitet, men ved højere doser, er vit. D-3 mest effektivt.

Vitamin B12

NNR 2012 anbefalinger:

Vitamin B ₁₂ µg/d		Women	Men	Children		
				2-5 y	6-9 y	10-13 y
Recommended intake	RI	2	2	0.8	1.3	2.0
Average requirement	AR	1.4	1.4			
Lower intake level	LI	1	1			
Upper intake level	UL	^a	^a			

^a Not established.

Fødevarestyrelsen:

“Hvis du er veganer, anbefaler Fødevarestyrelsen, at du tager et tilskud på 2 µg vitamin B12 pr. dag. Dette kan ligeledes være nødvendigt, hvis du som vegetar kun spiser sparsomt med æg og mælkeprodukter.”

Vitamin B12 tilskud

Vitamin B12 Recommendations: Choose One Option				
Age	US RDA (µg)	Option 1: Twice Daily (µg)	Option 2: Daily (µg)	Option 3: Twice Weekly (µg)
14–64 yrs	2.4	2.0-3.5	25-100	1000
65+ yrs	2.6	—	500-1000	Not Applicable
Pregnancy	2.6	2.5-4.0	25-100	Not Applicable
Breastfeeding	2.8	2.5-4.0	30-100	Not Applicable

<https://veganhealth.org/daily-needs/>

Der findes 4 former for B12-tilskud:

Cyanocobalamin - mest udbredte tilskudsform, anses for mest stabilt og de fleste undersøgelser er baseret på denne form. Bruges også til berigelse af fødevarer.

Methylcobalamin – Co-enzym, ikke så godt undersøgt

Adenosylcobalamin – Co-enzym, ikke så godt undersøgt

Vitamin B12 absorption

- ❁ Bindes til intrinsic factor og optages via receptorer i nedre ileum.
 - ❁ Lav bindingskapacitet, ca. $\frac{1}{2}$ af RI bindes og receptorerne kan først absorbere igen efter 4-6 timer. Der for anbefales indtag af B12-rige fødevarer fordelt over 2 daglige portioner.
- ❁ Passiv diffusion, her optages ca. 1 % af den indtagne mængde. Derfor højere dosis, hvis tilskud tages "sjældnere"
- ❁ Tilskud kan muligvis optages via mundslimhinde

Biotilgængelighed – hæmmere

- ❁ Fytinsyre: calcium, jern, magnesium, zink bundet til fosfor – gør dem svært optagelige
 - ❁ Iblødsætning og spiring: aktiverer fytase
 - ❁ Blendning: nedbryder cellevægge og frigør fytase
 - ❁ Fermentering: fytase fra bakterier, gær og svampe
- ❁ Oxalat: **calcium**, jern, magnesium, zink bundet til oxalsyre – gør dem svært optagelige
 - ❁ Iblødsætning og kogning

Kilder

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