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## Stress response and health affecting compounds in Brassicaceae

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## **References**

## References

- 1 Grusak MA, DellaPenna D. Improving the nutrient composition of plants to enhance human nutrition and health. *Annu Rev Plant Physiol Plant Mol Biol.* 1999; 50: 133-61.
- 2 Curtis IS. The noble radish: past, present and future. *Trends Plant Sci.* 2003; 8: 305-07.
- 3 Siemens DH, Garner SH, Mitchell-Olds T, Callaway RM. Cost of defense in the context of plant competition: *Brassica rapa* may grow and defend. *Ecology.* 2002; 83: 505-17.
- 4 Verkerk R, vanderGaag MS, Dekker M, Jongen WMF. Effects of processing conditions on glucosinolates in cruciferous vegetables. *Cancer Lett.* 1997; 114: 193-94.
- 5 Gomes MH, Rosa E. Free amino acid composition in primary and secondary inflorescences of 11 broccoli (*Brassica oleracea* var *italica*) cultivars and its variation between growing seasons. *J Sci Food Agric.* 2001; 81: 295-99.
- 6 Moreno DA, Carvajal M, Lopez-Berenguer C, Garcia-Viguera C. Chemical and biological characterisation of nutraceutical compounds of broccoli. *J Pharm Biomed Anal.* 2006; 41: 1508-22.
- 7 Rickman JC, Barrett DM, Bruhn CM. Nutritional comparison of fresh, frozen and canned fruits and vegetables. Part 1. Vitamins C and B and phenolic compounds. *J Sci Food Agric.* 2007; 87: 930-44.
- 8 Barnes S. Nutritional genomics, polyphenols, diets, and their impact on dietetics. *J Am Diet Assoc.* 2008; 108: 1888-95.
- 9 Halkier BA, Gershenson J. Biology and biochemistry of glucosinolates. *Annu Rev Plant Biol.* 2006; 57: 303.
- 10 Stoewsand GS. Bioactive organosulfur phytochemicals in *Brassica oleracea* vegetables - a review. *Food Chem Toxicol.* 1995; 33: 537-43.
- 11 Tomas-Barberan F, Espin JC. Phenolic compounds and related enzymes as determinants of quality in fruits and vegetables. *J Sci Food Agric.* 2001; 81: 853-76.
- 12 Tung YT, Wu JH, Huang CY, Kuo YH, Chang ST. Antioxidant activities and phytochemical characteristics of extracts from *Acacia confusa* bark. *Bioresour Technol.* 2009; 100: 509-14.
- 13 Sakihama Y, Cohen MF, Grace SC, Yamasaki H. Plant phenolic antioxidant and prooxidant activities: Phenolics-induced oxidative damage mediated by metals in plants. *Toxicology.* 2002; 177: 67-80.
- 14 Sun J, Liu RH. Apple phytochemical extracts inhibit proliferation of estrogen-dependent and estrogen-independent human breast cancer cells through cell cycle modulation. *J Agric Food Chem.* 2008; 56: 11661-67.
- 15 Habib SHM, Makpol S, Hamid NAA, Das S, Ngah WZW, Yusof YAM. Ginger extract (*Zingiber officinale*) has anti-cancer and anti-inflammatory effects on ethionine-induced hepatoma rats. *Clinics.* 2008; 63: 807-13.
- 16 Girish C, Pradhan SC. Drug development for liver diseases: Focus on picroliv, ellagic acid and curcumin. *Fundam Clin Pharmacol.* 2008; 22: 623-32.
- 17 Mattson MP, Cheng A. Neurohormetic phytochemicals: Low-dose toxins that induce adaptive neuronal stress responses. *Trends Neurosci.* 2006; 29: 632-39.
- 18 Zhao TJ, Liu Y, Yan YB, Feng F, Liu WQ, Zhou HM. Identification of the amino acids crucial for the activities of drought responsive element binding factors (DREBs) of *Brassica napus*. *FEBS Lett.* 2007; 581: 3044-50.

- 19 Sudha G, Ravishankar GA. Involvement and interaction of various signaling compounds on the plant metabolic events during defense response, resistance to stress factors, formation of secondary metabolites and their molecular aspects. *Plant Cell Tissue Organ Cult.* 2002; 71: 181-212.
- 20 Gratao PL, Polle A, Lea PJ, Azevedo RA. Making the life of heavy metal-stressed plants a little easier. *Funct Plant Biol.* 2005; 32: 481-94.
- 21 Schutzendubel A, Polle A. Plant responses to abiotic stresses: Heavy metal-induced oxidative stress and protection by mycorrhization. *J Exp Bot.* 2002; 53: 1351-65.
- 22 Salt DE, Blaylock M, Kumar NPBA, Dushenkov V, Ensley BD, Chet I, et al. Phytoremediation: A novel strategy for the removal of toxic metals from the environment using plants. *Nat Biotech.* 1995; 13: 468-74.
- 23 Parkpaine P, Sreesai S, Delaune RD. Bioavailability of heavy metals in sewage sludge-amended Thai soils. *Water Air Soil Pollut.* 2000; 122: 163-82.
- 24 Jahangir M, Abdel-Farid IB, Choi YH, Verpoorte R. Metal ion-inducing metabolite accumulation in *Brassica rapa*. *J Plant Physiol.* 2008; 165: 1429-37.
- 25 Kennedy AC. Bacterial diversity in agroecosystems. *Agriculture, Ecosystems & Environment.* 1999; 74: 65-76.
- 26 van Loon LC, Bakker P, Pieterse CMJ. Systemic resistance induced by rhizosphere bacteria. *Annu Rev Phytopathol.* 1998; 36: 453-83.
- 27 Jahangir M, Kim HK, Choi YH, Verpoorte R. Metabolomic response of *Brassica rapa* submitted to pre-harvest bacterial contamination. *Food Chem.* 2008; 107: 362-68.
- 28 Abdel-Farid BB, Kim HK, Choi YH, Verpoorte R. Metabolic characterization of *Brassica rapa* leaves by NMR spectroscopy. *J Agric Food Chem.* 2007; 55: 7936-43.
- 29 Roy MK, Juneja LR, Isobe S, Tsushima T. Steam processed broccoli (*Brassica oleracea*) has higher antioxidant activity in chemical and cellular assay systems. *Food Chem.* 2009; 114: 263-69.
- 30 Trischuk RG, Schilling BS, Wisniewski M, Gusta LV. Freezing stress: system biology to study of cold tolerance. In: Gusta LV (ed.). *Physiol Mol Biol Plants Stress Tol Plants* 2006; 131-55.
- 31 Jones RB, Faragher JD, Winkler S. A review of the influence of postharvest treatments on quality and glucosinolate content in broccoli (*Brassica oleracea* var. *italica*) heads. *Postharvest Biol Technol.* 2006; 41: 1-8.
- 32 Jia C-G, Xu C-J, Wei J, Yuan J, Yuan G-F, Wang B-L, et al. Effect of modified atmosphere packaging on visual quality and glucosinolates of broccoli florets. *Food Chem.* 2009; 114: 28-37.
- 33 Sharma SS, Dietz K-J. The significance of amino acids and amino acid-derived molecules in plant responses and adaptation to heavy metal stress. *J Exp Bot.* 2006; 57: 711-26.
- 34 Huber LS, Hoffmann-Ribani R, Rodriguez-Amaya DB. Quantitative variation in Brazilian vegetable sources of flavonols and flavones. *Food Chem.* 2009; 113: 1278-82.
- 35 Sumner LW, Mendes P, Dixon RA. Plant metabolomics: Large-scale phytochemistry in the functional genomics era. *Phytochemistry.* 2003; 62: 817-36.

## References

- 36 Choi YH, Kim HK, Linthorst HJM, Hollander JG, Lefeber AWM, Erkelens C, et al. NMR metabolomics to revisit the Tobacco Mosaic Virus infection in *Nicotiana tabacum* leaves. *J Nat Prod.* 2006; 69: 742-48.
- 37 Verpoorte R, Choi YH, Kim HK. NMR-based metabolomics at work in phytochemistry. *Phytochem Rev.* 2007; 6: 3-14.
- 38 Ratcliffe RG, Shachar-Hill Y. Revealing metabolic phenotypes in plants: Inputs from NMR analysis. *Biol Rev.* 2005; 80: 27-43.
- 39 Dowlatabadi R, Weljie AM, Thorpe TA, Yeung EC, Vogel HJ. Metabolic footprinting study of white spruce somatic embryogenesis using NMR spectroscopy. *Plant Physiol Biochem.* 47: 343-50.
- 40 Ahrens CH, Wagner U, Rehrauer HK, Turker C, Schlapbach R. Current challenges and approaches for the synergistic use of systems biology data in the scientific community. *Plant syst Biol.* 2007: 277-307.
- 41 Liang YS, Choi YH, Kim HK, Linthorst HJM, Verpoorte R. Metabolomic analysis of methyl jasmonate treated *Brassica rapa* leaves by 2-dimensional NMR spectroscopy. *Phytochemistry.* 2006; 67: 2503-11.
- 42 Sasaki K, Takahashi T. A flavonoid from *Brassica rapa* flower as the UV-absorbing nectar guide. *Phytochemistry.* 2002; 61: 339-43.
- 43 O'Callaghan KJ, Stone PJ, Hu XJ, Griffiths DW, Davey MR, Cocking EC. Effects of glucosinolates and flavonoids on colonization of the roots of *Brassica napus* by *Azorhizobium caulinodans* ORS571. *Appl Environ Microbiol.* 2000; 66: 2185-91.
- 44 Onyilagha JC, Lazorko J, Gruber MY, Soroka JJ, Erlandson MA. Effect of flavonoids on feeding preference and development of the crucifer pest *Mamestra configurata* Walker. *J Chem Ecol.* 2004; 30: 109-24.
- 45 Kaushik N, Agnihotri A. GLC analysis of Indian rapeseed-mustard to study the variability of fatty acid composition. *Biochem Soc T.* 2000: 581-83.
- 46 Ferreres F, Sousa C, Valentao P, Seabra RM, Pereira JA, Andrade PB. Tronchuda cabbage (*Brassica oleracea* L. var. *costata* DC) seeds: Phytochemical characterization and antioxidant potential. *Food Chem.* 2007; 101: 549-58.
- 47 Font R, del Rio-Celestino M, Cartea E, de Haro-Bailon A. Quantification of glucosinolates in leaves of leaf rape (*Brassica napus* ssp *pabularia*) by near-infrared spectroscopy. *Phytochemistry.* 2005; 66: 175-85.
- 48 Sardi E, Tordai E. Determination of fully N-methylated compound in different cabbage and beetroot varieties. *Acta Biol Szeg.* 2005; 49: 43-45.
- 49 Kusznierekowicz B, Bartoszek A, Wolska L, Drzewiecki J, Gorinstein S, Namiesnik J. Partial characterization of white cabbages (*Brassica oleracea* var *capitata* f. *alba*) from different regions by glucosinolates, bioactive compounds, total antioxidant activities and proteins. *LWT-Food Sci Technol.* 2008; 41: 1-9.
- 50 Heaney RK, Fenwick GR. Natural toxins and protective factors in *Brassica* species, including rapeseed. *Nat Toxins.* 1995; 3: 233-37.
- 51 Thiayam U, Kuhlmann A, Stockmann H, Schwarz K. Prospects of rapeseed oil by-products with respect to antioxidative potential. *Les Comptes Rendus Chimie.* 2004: 611-16.

- 52 Dekker M, Verkerk R, Jongen WMF. Predictive modelling of health aspects in the food production chain: a case study on glucosinolates in cabbage. *Trends Food Sci Technol.* 2000; 11: 174-81.
- 53 Vallejo F, Tomas-Barberan FA, García-Viguera C. Potential bioactive compounds in health promotion from broccoli cultivars grown in Spain. *J Sci Food Agric.* 2002; 82: 1293-97.
- 54 Vallejo F, Tomas-Barberan F, Garcia-Viguera C. Health-promoting compounds in broccoli as influenced by refrigerated transport and retail sale period. *J Agric Food Chem.* 2003; 51: 3029-34.
- 55 Vallejo F, Gil-Izquierdo A, Perez-Vicente A, Garcia-Viguera C. In vitro gastrointestinal digestion study of broccoli inflorescence phenolic compounds, glucosinolates, and vitamin C. *J Agric Food Chem.* 2004; 52: 135-38.
- 56 Pedroche J, Yust MM, Lqari H, Giron-Calle J, Alaiz M, Vioque J, et al. *Brassica carinata* protein isolates: chemical composition, protein characterization and improvement of functional properties by protein hydrolysis. *Food Chem.* 2004; 88: 337-46.
- 57 Fowke JH, Chung FL, Jin F, Qi D, Cai QY, Conaway C, et al. Urinary isothiocyanate levels, *Brassica*, and human breast cancer. *Cancer Res.* 2003; 63: 3980-86.
- 58 Heimler D, Vignolini P, Dini MG, Vincieri FF, Romani A. Antiradical activity and polyphenol composition of local *Brassicaceae* edible varieties. *Food Chem.* 2006; 99: 464-69.
- 59 Zakaria-Rungkat F, Djaelani M, Setiana, Rumondang E, Nurrochmah. Carotenoid bioavailability of vegetables and carbohydrate-containing foods measured by retinol accumulation in rat livers. *J Food Compos Anal.* 2000; 13: 297-310.
- 60 Rice-Evans C, Miller N, Paganga G. Antioxidant properties of phenolic compounds. *Trends Plant Sci.* 1997; 2: 152-59.
- 61 Kristal AR, Lampe JW. *Brassica* vegetables and prostate cancer risk: A review of the epidemiological evidence. *Nutr Cancer.* 2002; 42: 1 - 9.
- 62 Wang LI, Giovannucci EL, Hunter D, Neuberg D, Su L, Christiani DC. Dietary intake of cruciferous vegetables, glutathione S-transftrase (GST) polymorphisms and lung cancer risk in a Caucasian population. *Cancer Causes Control.* 2004; 15: 977-85.
- 63 Zukalova H, Vasak J. The role and effects of glucosinolates of *Brassica* species - a review. *Rostl Vyroba.* 2002; 48: 175-80.
- 64 Samaila D, Ezekwudo DE, Yimam KK, Elegbede JA. Bioactive plant compounds inhibited the proliferation and induced apoptosis in human cancer cell lines, *in vitro*. *Trans Int Biomed: Inform Enabl Tech Symp J.* 2004; 1: 34-42.
- 65 Hanf V, Gonder U. Nutrition and primary prevention of breast cancer: Foods, nutrients and breast cancer risk. *Eur J Obstet Gynecol Reprod Biol.* 2005; 123: 139-49.
- 66 Staub RE, Feng C, Onisko B, Bailey GS, Firestone GL, Bjeldanes LF. Fate of indole-3-carbinol in cultured human breast tumor cells. *Chem Res Toxicol.* 2002; 15: 101-09.
- 67 Cover CM, Hsieh SJ, Tran SH, Hallden G, Kim GS, Bjeldanes LF, et al. Indole-3-carbinol Inhibits the expression of cyclin-dependent kinase-6 and

## References

- Induces a G1 cell cycle arrest of human breast cancer cells independent of estrogen receptor signaling. *J Biol Chem.* 1998; 273: 3838-47.
- 68 Steinkellner H, Rabot S, Freywald C, Nobis E, Chabicoskyk M, Knasmuller S, *et al.* Effects of cruciferous vegetables and their constituents on drug metabolizing enzymes involved in the bioactivation of DNA-reactive dietary carcinogens. *Mutat Res-Fund Mol M.* 2001; 480: 285-97.
- 69 O'Connor SE, Maresh JJ. Chemistry and biology of monoterpene indole alkaloid biosynthesis. *ChemInform.* 2006; 37.
- 70 Dixon RA. Natural products and plant disease resistance. *Nature.* 2001; 411: 843-47.
- 71 Winkel-Shirley B. Flavonoid biosynthesis. A colorful model for genetics, biochemistry, cell biology, and biotechnology. *Plant Physiol.* 2001; 126: 485-93.
- 72 Graser G, Schneider B, Oldham NJ, Gershenson J. The methionine chain elongation pathway in the biosynthesis of glucosinolates in *Eruca sativa* (Brassicaceae). *Arch Biochem Biophys.* 2000; 378: 411-19.
- 73 Dixon RA, Paiva NL. Stress-induced phenylpropanoid metabolism. *Plant Cell.* 1995; 7: 1085-97.
- 74 Azuma K, Ippoushi K, Ito H, Higashio H, Terao J. Evaluation of antioxidative activity of vegetable extracts in linoleic acid emulsion and phospholipid bilayers. *J Sci Food Agric.* 1999; 79: 2010-16.
- 75 Ferguson LR. Prospects for cancer prevention. *Mutat Res-Fund Mol M.* 1999; 428: 329-38.
- 76 Kopsell DE, Kopsell DA, Randle WA, Coolong TW, Sams CE, Curran-Celentano J. Kale carotenoids remain stable while flavor compounds respond to changes in sulfur fertility. *J Agric Food Chem.* 2003; 51: 5319-25.
- 77 Mithen RF, Dekker M, Verkerk R, Rabot S, Johnson IT. The nutritional significance, biosynthesis and bioavailability of glucosinolates in human foods. *J Sci Food Agric.* 2000; 80: 967-84.
- 78 Matthaus B, Angelini LG. Anti-nutritive constituents in oilseed crops from Italy. *Indus. Crops Prod.* 2005; 21: 89-99.
- 79 Kurilich AC, Tsau GJ, Brown A, Howard L, Klein BP, Jeffery EH, *et al.* Carotene, tocopherol, and ascorbate contents in subspecies of *Brassica oleracea*. *J Agric Food Chem.* 1999; 47: 1576-81.
- 80 Verhoeven DTH, Goldbohm RA, vanPoppel G, Verhagen H, vandenBrandt PA. Epidemiological studies on *Brassica* vegetables and cancer risk. *Cancer Epidemiol Biomark Prev.* 1996; 5: 733-48.
- 81 Kurilich AC, Jeffery EH, Juvik JA, Wallig MA, Klein BP. Antioxidant capacity of different broccoli (*Brassica oleracea*) genotypes using the oxygen radical absorbance capacity (ORAC) assay. *J Agric Food Chem.* 2002; 50: 5053-57.
- 82 Eberhardt MV, Kobira K, Keck AS, Juvik JA, Jeffery EH. Correlation analyses of phytochemical composition, chemical, and cellular measures of antioxidant activity of broccoli (*Brassica oleracea* L. var. *italica*). *J Agric Food Chem.* 2005; 53: 7421-31.
- 83 Granado F, Olmedilla B, Herrero C, Perez-Sacristan B, Blanco I, Blazquez S. Bioavailability of carotenoids and tocopherols from broccoli: In vivo and in vitro assessment. *Exp Biol Med.* 2006; 231: 1733-38.

- 84 Miyazawa M, Nishiguchi T, Yamafuji C. Volatile components of the leaves of *Brassica rapa* L. var. *perviridis* Bailey. *Flavour Fragr J.* 2005; 20: 158-60.
- 85 Wills RBH, Rangga A. Determination of carotenoids in Chinese vegetables. *Food Chem.* 1996; 56: 451-55.
- 86 Riso P, Brusamolino A, Ciappellano S, Porrini M. Comparison of lutein bioavailability from vegetables and supplement. *Int J Vitam Nutr Res.* 2003; 73: 201-05.
- 87 Khachik F, Steck A, Pfander H. Isolation and structural elucidation of(13Z,13 ' Z,3R,3 ' R,6 ' R)-lutein from marigold flowers, kale, and human plasma. *J Agric Food Chem.* 1999; 47: 455-61.
- 88 Lefsrud MG, Kopsell DA. Kale carotenoids are unaffected by, whereas biomass production, elemental concentrations, and selenium accumulation respond to, changes in selenium fertility. *J Agric Food Chem.* 2006; 54: 1764-71.
- 89 Podsedek A. Natural antioxidants and antioxidant capacity of *Brassica* vegetables: A review. *LWT-Food Sci Technol.* 2007; 40: 1-11.
- 90 Pironen V, Syvaaja EL, Varo P, Salminen K, Koivistoinen P. Tocopherols and tocotrienols in Finnish foods: Vegetables, fruits, and berries. *J Agric Food Chem.* 1986; 34: 742-46.
- 91 Goffman FD, Mollers C. Changes in tocopherol and plastochromanol-8 contents in seeds and oil of oilseed rape (*Brassica napus* L.) during storage as influenced by temperature and air oxygen. *J Agric Food Chem.* 2000; 48: 1605-09.
- 92 Bahorun T, Luximon-Ramma A, Crozier A, Aruoma OI. Total phenol, flavonoid, proanthocyanidin and vitamin C levels and antioxidant activities of Mauritian vegetables. *J Sci Food Agric.* 2004; 84: 1553-61.
- 93 Goldoni JS, Bonassi IA, Conceicao FA. Comparative study of vitamin C of cabbage cultivars (*Brassica oleraceae* L., var. *capitata* L.), before and after their processing in sauerkraut. *Arch Latinoam Nutr.* 1983; 33: 45-56.
- 94 McKillop DJ, Pentieva K, Daly D, McPartlin JM, Hughes J, Strain JJ, et al. The effect of different cooking methods on folate retention in various foods that are amongst the major contributors to folate intake in the UK diet. *Br J Nutr.* 2002; 88: 681-88.
- 95 Melse-Boonstra A, Verhoef P, Konings EJM, van Dusseldorp M, Matser A, Hollman PCH, et al. Influence of processing on total, monoglutamate and polyglutamate folate contents of leeks, cauliflower, and green beans. *J Agric Food Chem.* 2002; 50: 3473-78.
- 96 Puupponen-Pimia R, Hakkinen ST, Aarni M, Suortti T, Lampi AM, Eurola M, et al. Blanching and long-term freezing affect various bioactive compounds of vegetables in different ways. *J Sci Food Agric.* 2003; 83: 1389-402.
- 97 Devi R, Arcot J, Soheeswaran S, Ali S. Folate contents of some selected Fijian foods using tri-enzyme extraction method. *Food Chem.* 2008; 106: 1100-04.
- 98 Bailey LB, Rampersaud GC, Kauwell GPA. Folic acid supplements and fortification affect the risk for neural tube defects, vascular disease and cancer: Evolving science. *J Nutr.* 2003; 133: 1961S-68S.
- 99 Cornel MC, Smit DJd, de Jong-van den Berg LTW. Folic acid - The scientific debate as a base for public health policy. *Reprod Toxicol.* 2005; 20: 411-15.

## References

- 100 Bollheimer LC, Buettner R, Kullmann A, Kullmann F. Folate and its preventive potential in colorectal carcinogenesis: How strong is the biological and epidemiological evidence? *Crit Rev Oncol Hematol.* 2005; 55: 13-36.
- 101 Singh J, Upadhyay AK, Prasad K, Bahadur A, Rai M. Variability of carotenes, vitamin C, E and phenolics in *Brassica* vegetables. *J Food Compos Anal.* 2007; 20: 106-12.
- 102 Singh G, Kawatra A, Sehgal S. Nutritional composition of selected green leafy vegetables, herbs and carrots. *Plant Foods Hum Nutr.* 2001; 56: 359-64.
- 103 Tirasoglu E, Cevik U, Ertugral B, Apaydin G, Baltas H, Ertugrul M. Determination of trace elements in cole (*Brassica oleraceae* var. *acephale*) at Trabzon region in Turkey. *J Quant Spectrosc Ra.* 2005; 94: 181-87.
- 104 Finley JW. Reduction of cancer risk by consumption of selenium-enriched plants: Enrichment of broccoli with selenium increases the anticarcinogenic properties of broccoli. *J Med Food.* 2003; 6: 19-26.
- 105 Heaney RK, Weaver CM, Hinders SM, Martin B, Packard PT. Absorbability of calcium from *Brassica* vegetables: Broccoli, bok choy, and kale. *J Food Sci.* 1993; 58: 1378-80.
- 106 Glew RS, VanderJagt DJ, Bosse R, Huang YS, Chuang LT, Glew RH. The nutrient content of three edible plants of the Republic of Niger. *J Food Compos Anal.* 2005; 18: 15-27.
- 107 Elless MP, Blaylock MJ, Huang JW, Gussman CD. Plants as a natural source of concentrated mineral nutritional supplements. *Food Chem.* 2000; 71: 181-88.
- 108 Kmiecik W, Lisiewska Z, Korus A. Retention of mineral constituents in frozen brassicas depending on the method of preliminary processing of the raw material and preparation of frozen products for consumption. *Eur Food Res Technol.* 2007; 224: 573-79.
- 109 Kawashima LM, Valente Soares LM. Mineral profile of raw and cooked leafy vegetables consumed in southern Brazil. *J Food Compos Anal.* 2003; 16: 605-11.
- 110 He ZL, Yang XE, Stoffella PJ. Trace elements in agroecosystems and impacts on the environment. *J Trace Elem Med Biol.* 2005; 19: 125-40.
- 111 Banuelos GS. Phyto-products may be essential for sustainability and implementation of phytoremediation. *Environ Pollut.* 2006; 144: 19-23.
- 112 Dudka S, Miller WP. Permissible concentrations of arsenic and lead in soils based on risk assessment. *Water Air Soil Pollut.* 1999; 113: 127-32.
- 113 Naczk M, Amarowicz R, Sullivan A, Shahidi F. Current research developments on polyphenolics of rapeseed/canola: A review. *Food Chem.* 1998; 62: 489-502.
- 114 Choudhury AR, Das T, Sharma A. Mustard oil and garlic extract as inhibitors of sodium arsenite-induced chromosomal breaks in vivo. *Cancer Lett.* 1997; 121: 45-52.
- 115 Dwivedi C, Muller LA, Goetz-Parten DE, Kasperson K, Mistry VV. Chemopreventive effects of dietary mustard oil on colon tumor development. *Cancer Lett.* 2003; 196: 29-34.
- 116 Ahuja KL, Batta SK, Raheja RK, Labana KS, Gupta ML. Oil content and fatty acid composition of promising Indian *Brassica campestris* L. (Toria) genotypes. *Plant Foods Hum Nutr.* 1989; 39: 155-60.

- 117 Vermunt SHF, Beaufreire B, Riemersma RA, Sebedio J-L, Chardigny J-M, Mensink RP. Dietary trans- $\alpha$ -linolenic acid from deodorised rapeseed oil and plasma lipids and lipoproteins in healthy men: the *TransLinE* Study. *Br J Nutr.* 2001; 85: 387-92.
- 118 Adamska E, Cegielska-Taras T, Kackzmarek Z, Szala L. Multivariate approach to evaluating the fatty acid composition of seed oil in a doubled haploid population of winter oilseed rape (*Brassica napus* L.). *J Appl Genetics* 2004; 45: 419-25.
- 119 Scalzo RL, Bianchi G, Genna A, Summa C. Antioxidant properties and lipidic profile as quality indexes of cauliflower (*Brassica oleracea* L. var. *botrytis*) in relation to harvest time. *Food Chem.* 2007; 100: 1019-25.
- 120 Mcewan M, Smith WHM. Identification of volatile organic compounds emitted in the field by oilseed rape (*Brassica napus* ssp. *oleifera*) over the growing season. *Clin Exp Allergy.* 1998; 28: 332-38.
- 121 Vuorinen T, Reddy GVP, Nerg A-M, Holopainen JK. Monoterpene and herbivore-induced emissions from cabbage plants grown at elevated atmospheric CO<sub>2</sub> concentration. *Atmos Environ.* 2004; 38: 675-82.
- 122 Lechner M, Reiter B, Lorbeer E. Determination of tocopherols and sterols in vegetable oils by solid-phase extraction and subsequent capillary gas chromatographic analysis. *J Chromatogr A.* 1999; 857: 231-38.
- 123 Appelqvist L-AD, Kornfeld AK, Wennerholm JE. Sterols and steryl esters in some *Brassica* and sinapis seeds. *Phytochemistry.* 1981; 20: 207-10.
- 124 Hobbs DH, Hume JH, Rolph CE, Cooke DT. Changes in lipid composition during floral development of *Brassica campestris*. *Phytochemistry.* 1996; 42: 335-39.
- 125 Ayaz FA, Glew RH, Millson M, Huang HS, Chuang LT, Sanz C, et al. Nutrient contents of kale (*Brassica oleraceae* L. var. *acephala* DC.). *Food Chem.* 2006; 96: 572-79.
- 126 Rule DC, Busboom JR, Kercher CJ. Effect of dietary canola on fatty acid composition of bovine adipose tissue, muscle, kidney, and liver. *J Anim Sci.* 1994; 72: 2735-44.
- 127 Rosa E, David M, Gomes MH. Glucose, fructose and sucrose content in broccoli, white cabbage and Portuguese cabbage grown in early and late seasons. *J Sci Food Agric.* 2001; 81: 1145-49.
- 128 King GA, Morris SC. Early compositional changes during postharvest senescence of broccoli. *J Am Soc Hortic Sci.* 1994; 119: 1000-05.
- 129 Simbaya J, Slominski BA, Rakow G, Campbell LD, Downey RK, Bell JM. Quality characteristics of yellow-seeded *Brassica* seed meals: Protein, carbohydrate, and dietary fiber components. *J Agric Food Chem.* 1995; 43: 2062-66.
- 130 Knudsen KEB. The nutritional significance of "dietary fibre" analysis. *Anim Feed Sci Technol.* 2001; 90: 3-20.
- 131 Rodriguez R, Jimenez A, Fernandez-Bolanos J, Guillen R, Heredia A. Dietary fibre from vegetable products as source of functional ingredients. *Trends Food Sci Technol.* 2006; 17: 3-15.
- 132 Wennberg M, Engqvist G, Nyman M. Effects of harvest time and storage on dietary fibre components in various cultivars of white cabbage (*Brassica oleracea* var *capitata*). *J Sci Food Agric.* 2002; 82: 1405-11.

## References

- 133 Wennberg M, Ekvall J, Olsson K, Nyman M. Changes in carbohydrate and glucosinolate composition in white cabbage (*Brassica oleracea* var. *capitata*) during blanching and treatment with acetic acid. *Food Chem.* 2006; 95: 226-36.
- 134 Slominski BA, Simbaya J, Campbell LD, Rakow G, Guenter W. Nutritive value for broilers of meals derived from newly developed varieties of yellow-seeded canola. *Anim Feed Sci Technol.* 1999; 78: 249-62.
- 135 Jensen CR, Mogensen VO, Mortensen G, Fieldsend JK, Milford GFJ, Andersen MN, et al. Seed glucosinolate, oil and protein contents of field-grown rape (*Brassica napus* L.) affected by soil drying and evaporative demand. *Field Crops Res.* 1996; 47: 93-105.
- 136 Mahajan A, Dua S. Nonchemical approach for reducing antinutritional factors in rapeseed (*Brassica campestris* Var. *Toria*) and characterization of enzyme phytase. *J Agric Food Chem.* 1997; 45: 2504-08.
- 137 Rozan P, Lamghari R, Linder M, Villaume C, Fanni J, Parmentier M, et al. In Vivo and in vitro digestibility of soybean, lupine, and rapeseed meal proteins after various technological processes. *J Agric Food Chem.* 1997; 45: 1762-69.
- 138 Berot S, Compoint JP, Larre C, Malabat C, Gueguen J. Large scale purification of rapeseed proteins (*Brassica napus* L.). *J Chromatogr B.* 2005; 818: 35-42.
- 139 Aluko RE, McIntosh T. Polypeptide profile and functional properties of defatted meals and protein isolates of canola seeds. *J Sci Food Agric.* 2001; 81: 391-96.
- 140 Ghodvali A, Khodaparast MHH, Vosoughi M, Diosady LL. Preparation of canola protein materials using membrane technology and evaluation of meals functional properties. *Food Res Int.* 2005; 38: 223-31.
- 141 Puimalainen TJ, Poikonen S, Kotovuori A, Vaali K, Kalkkinen N, Reunala T, et al. Napins, 2S albumins, are major allergens in oilseed rape and turnip rape. *J Allergy Clin Immunol.* 2006; 117: 426-32.
- 142 Suido H, Tanaka T, Tabei T, Takeuchi A, Okita M, Kishimoto T, et al. A mixed green vegetable and fruit beverage decreased the serum level of low-density lipoprotein cholesterol in hypercholesterolemic patients. *J Agric Food Chem.* 2002; 50: 3346-50.
- 143 Morrissey JP, Osbourn AE. Fungal resistance to plant antibiotics as a mechanism of pathogenesis. *Microbiol Mol Biol Rev.* 1999; 63: 708-24.
- 144 Grayer RJ, Harborne JB. A survey of antifungal compounds from higher plants, 1982-1993. *Phytochemistry.* 1994; 37: 19-42.
- 145 Smith CJ. Accumulation of phytoalexins: Defence mechanism and stimulus response system. *New Phytol.* 1996; 132: 1-45.
- 146 Rogers EE, Glazebrook J, Ausubel FM. Mode of action of *Arabidopsis thaliana* phytoalexin camalexin and its role in *Arabidopsis* - pathogen interactions. *Mol Plant Microbe Interact.* 1996; 9: 748-57.
- 147 Pedras MSC, Okanga FI, Zaharia IL, Khan AQ. Phytoalexins from crucifers: Synthesis, biosynthesis, and biotransformation. *Phytochemistry.* 2000; 53: 161-76.
- 148 Reuber TL, Plotnikova JM, Dewdney J, Rogers EE, Wood W, Ausubel FM. Correlation of defense gene induction defects with powdery mildew susceptibility in *Arabidopsis* enhanced disease susceptibility mutants. *Plant J.* 1998; 16: 473-85.
- 156

- 149 Roetschi A, Si-Ammour A, Belbahri L, Mauch F, Mauch-Mani B. Characterization of an *Arabidopsis-Phytophthora* pathosystem: resistance requires a functional PAD2 gene and is independent of salicylic acid, ethylene and jasmonic acid signalling. *Plant J.* 2001; 28: 293-305.
- 150 Mezencey R, Mojzis J, Pilatova M, Neoplasma KP. Antiproliferative and cancer chemopreventive activity of phytoalexins: focus on indole phytoalexins from crucifers. *Neoplasma.* 2003; 50: 239-45.
- 151 Kaplan F, Kopka J, Haskell DW, Zhao W, Schiller KC, Gatzke N, et al. Exploring the temperature-stress metabolome of *Arabidopsis*. *Plant Physiol.* 2004; 136: 4159-68.
- 152 Ryan C, Pearce G, Scheer J, Moura DS. Polypeptide hormones. *Plant Cell.* 2002; 14: 251-64.
- 153 Ryan CA, Pearce G. Systemins: A functionally defined family of peptide signals that regulate defensive genes in *Solanaceae* species. *Proc Natl Acad Sci USA* 2003; 14577-80.
- 154 Halitschke R, Baldwin IT. Jasmonates and related compounds in plant-insect interactions. *J Plant Growth Regul.* 2004; 23: 238-45.
- 155 Creelman RA, Mullet JE. Biosynthesis and action of jasmonates in plants. *Annu Rev Plant Physiol Plant Mol Biol.* 1997; 48: 355-81.
- 156 Beale MH, Ward JL. Jasmonates: Key players in the plant defense. *Nat Prod Rep.* 1998; 15: 533-48.
- 157 Blee E. Phytooxylipins and plant defense reactions. *Prog Lipid Res.* 1998; 37: 33-72.
- 158 Devoto A, Turner JG. Regulation of jasmonate-mediated plant responses in *Arabidopsis*. *Ann Bot.* 2003; 92: 329-37.
- 159 Farmer EE, Almeras E, Krishnamurthy V. Jasmonates and related oxylipins in plant responses to pathogenesis and herbivory. *Curr Opin Plant Biol.* 2003; 6: 372-78.
- 160 Flescher E. Jasmonates-a new family of anti-cancer agents. *Anticancer Drugs.* 2005; 16: 911-16.
- 161 Pascale SD, Maggio A, Pernice R, Fogliano V, Barbieri G. Sulphur fertilization may improve the nutritional value of *Brassica rapa* L. subsp. *sylvestris*. *Eur J Agron.* 2007; 26: 418-24.
- 162 Rice-Evans CA, Miller NJ, Paganga G. Structure-antioxidant activity relationships of flavonoids and phenolic acids. *Free Radic Biol Med.* 1996; 20: 933-56.
- 163 Ninfali P, Bacchiocca M. Polyphenols and antioxidant capacity of vegetables under fresh and frozen conditions. *J Agric Food Chem.* 2003; 51: 2222-26.
- 164 Singh J, Upadhyay AK, Bahadur A, Singh B, Singh KP, Rai M. Antioxidant phytochemicals in cabbage (*Brassica oleracea* L. var. *capitata*). *Sci Hortic.* 2006; 108: 233-37.
- 165 Clifford MN. Chlorogenic acids and other cinnamates - nature, occurrence, dietary burden, absorption and metabolism. *J Sci Food Agric.* 2000; 80: 1033-43.
- 166 Kroon PA, Williamson G. Hydroxycinnamates in plants and food: Current and future perspectives. *J Sci Food Agric.* 1999; 79: 355-61.

## References

- 167 Gagandeep, Dhiman M, Mendiz E, Rao AR, Kale RK. Chemopreventive effects of mustard (*Brassica campestris*) on chemically induced tumorigenesis in murine forestomach and uterine cervix. *Hum Exp Toxicol.* 2005; 24: 303-12.
- 168 Wanasyukula U, Shahidi F. Canola extract as an alternative natural antioxidant for canola oil. *J Am Oil Chem Soc.* 1994; 71: 817-22.
- 169 Llorach R, Espin JC, Tomas-Barberan FA, Ferreres F. Valorization of cauliflower (*Brassica oleracea* L. var. *botrytis*) by-products as a source of antioxidant phenolics. *J Agric Food Chem.* 2003; 51: 2181-87.
- 170 Robbers JE, Speedie MK, Tyler VE (eds). *Pharmacognosy and pharmacobiotechnology*. Williams and Wilkins: Baltimore 1996.
- 171 Robbins RJ, Keck A-S, Banuelos G, Finley JW. Cultivation conditions and selenium fertilization alter the phenolic profile, glucosinolate, and sulforaphane content of broccoli. *J Med Food.* 2005; 8: 204-14.
- 172 Solecka D, Boudet A-M, Kacperska A. Phenylpropanoid and anthocyanin changes in low-temperature treated winter oilseed rape leaves. *Plant Physiol Biochem.* 1999; 37: 491-96.
- 173 Ayaz FA, Hayırıoglu-Ayaz S, Alpay-Karaoglu S, Gruž J, Valentova K, Ulrichova J, et al. Phenolic acid contents of kale (*Brassica oleraceae* L. var. *acephala* DC.) extracts and their antioxidant and antibacterial activities. *Food Chem.* 2008; 107: 19-25.
- 174 Vuorela S, Meyer A, Heinonen M. Quantitative analysis of the main phenolics in rapeseed meal and oils processed differently using enzymatic hydrolysis and HPLC. *Eur Food Res Technol.* 2003; 217: 517-23.
- 175 Vuorela S, Kreander K, Karonen M, Nieminen R, Hamalainen M, Galkin A, et al. Preclinical evaluation of rapeseed, raspberry, and pine bark phenolics for health related effects. *J Agric Food Chem.* 2005; 53: 5922-31.
- 176 Zou Y, Kim AR, Kim JE, Choi JS, Chung HY. Peroxynitrite scavenging activity of sinapic acid (3,5-dimethoxy-4-hydroxycinnamic acid) isolated from *Brassica juncea*. *J Agric Food Chem.* 2002; 50: 5884-90.
- 177 Regenbrecht J, Strack D. Distribution of 1-sinapoylglucose: Choline sinapoyltransferase activity in the *Brassicaceae*. *Phytochemistry.* 1985; 24: 407-10.
- 178 Baumert A, Milkowski C, Schmidt J, Nimtz M, Wray V, Strack D. Formation of a complex pattern of sinapate esters in *Brassica napus* seeds, catalyzed by enzymes of a serine carboxypeptidase-like acyltransferase family? *Phytochemistry.* 2005; 66: 1334-45.
- 179 Berlin J (ed). Secondary products from plant cell cultures. 2nd edn. VCH: Federal Republic of Germany 1997.
- 180 Caporale LH. Chemical ecology: A view from the pharmaceutical industry. *Proc Natl Acad Sci U S A.* 1995; 92: 75-82.
- 181 Morton LW, Caccetta RA-A, Pudsey IB, Croft KD. Chemistry and biological effects of dietary phenolic compounds: Relevance to cardiovascular disease. *Clin Exp Pharmacol Physiol.* 2000; 27: 152-59.
- 182 Chu Y-H, Chang C-L, Hsu H-F. Flavonoid content of several vegetables and their antioxidant activity. *J Sci Food Agric.* 2000; 80: 561-66.
- 183 Birt DF, Hendrich S, Wang W. Dietary agents in cancer prevention: Flavonoids and isoflavonoids. *Pharmacol Ther.* 2001; 90: 157-77.

- 184 Omenn GS. What accounts for the association of vegetables and fruits with lower incidence of cancers and coronary heart disease? *Ann Epidemiol.* 1995; 5: 333-35.
- 185 Williams RJ, Spencer JPE, Rice-Evans C. Flavonoids: Antioxidants or signalling molecules? *Free Radic Biol Med.* 2004; 36: 838-49.
- 186 Skibola CF, Smith MT. Potential health impacts of excessive flavonoid intake. *Free Radic Biol Med.* 2000; 29: 375-83.
- 187 Siqueira JO, Safir GR, Nair MG. Stimulation of vesicular-arbuscular mycorrhiza formation and growth of white clover by flavonoid compounds. *New Phytol.* 1991; 118: 87-93.
- 188 Le Marchand L. Cancer preventive effects of flavonoids - a review. *Biomed Pharmacother.* 2002; 56: 296-301.
- 189 Nielsen JK, Nørbaek R, Olsen CE. Kaempferol tetraglucosides from cabbage leaves. *Phytochemistry.* 1998; 49: 2171-76.
- 190 Onyilagha J, Bala A, Hallett R, Gruber M, Soroka J, Westcott N. Leaf flavonoids of the cruciferous species, *Camelina sativa*, *Crambe spp.*, *Thlaspi arvense* and several other genera of the family *Brassicaceae*. *Biochem Syst Ecol.* 2003; 31: 1309-22.
- 191 Chun OK, Smith N, Sakagawa A, Lee CY. Antioxidant properties of raw and processed cabbages. *Int J Food Sci Nutr.* 2004; 55: 191 - 99.
- 192 Price KR, Casuscelli F, Colquhoun IJ, Rhodes MJC. Composition and content of flavonol glycosides in broccoli florets (*Brassica olearacea*) and their fate during cooking. *J Sci Food Agric.* 1998; 77: 468-72.
- 193 Ferreres F, Valentao P, Llorach R, Pinheiro C, Cardoso L, Pereira JA, et al. Phenolic compounds in external leaves of Tronchuda cabbage (*Brassica oleracea* L. var. *costata* DC). *J Agric Food Chem.* 2005; 53: 2901-07.
- 194 Ponce MA, Scervino JM, Erra-Balsells R, Ocampo JA, Godeas AM. Flavonoids from shoots, roots and roots exudates of *Brassica alba*. *Phytochemistry.* 2004; 65: 3131-34.
- 195 Giusti MM, Wrolstad RE. Acylated anthocyanins from edible sources and their applications in food systems. *Biochem Eng J.* 2003; 14: 217-25.
- 196 Scalzo RL, Genna A, Branca F, Chedin M, Chassaigne H. Anthocyanin composition of cauliflower (*Brassica oleracea* L. var. *botrytis*) and cabbage (*B. oleracea* L. var. *capitata*) and its stability in relation to thermal treatments. *Food Chem.* 2008; 107: 136-44.
- 197 Dyrby M, Westergaard N, Stapelfeldt H. Light and heat sensitivity of red cabbage extract in soft drink model systems. *Food Chem.* 2001; 72: 431-37.
- 198 Otsuki T, Matsufuji H, Takeda M, Toyoda M, Goda Y. Acylated anthocyanins from red radish (*Raphanus sativus* L.). *Phytochemistry.* 2002; 60: 79-87.
- 199 Cutillo F, D'Abrosca B, DellaGreca M, Fiorentino A, Zarrelli A. Lignans and neolignans from *Brassica fruticulosa*: Effects on seed germination and plant growth. *J Agric Food Chem.* 2003; 51: 6165-72.
- 200 Erdemoglu N, Sener B, Choudhary MI. Bioactivity of lignans from *Taxus baccata*. *Z Naturforsch C.* 2004; 59: 494-98.
- 201 Durkee AB. The nature of tannin in rapeseed (*Brassica campestris*). *Phytochemistry.* 1971; 10: 1583-85.

## References

- 202 Sadeghi MA, Rao AGA, Bhagya S. Evaluation of mustard (*Brassica juncea*) protein isolate prepared by steam injection heating for reduction of antinutritional factors. *Food Sci Technol.* 2006; 39: 911-17.
- 203 Shahidi F (ed). Antinutrients and phytochemical in food. American Chemical Society: Washington, DC 1995.
- 204 McSweeney CS, Gough J, Conlan LL, Hegarty MP, Palmer B, Krause DO. Nutritive value assessment of the tropical shrub legume *Acacia angustissima*: Anti-nutritional compounds and in vitro digestibility. *Anim Feed Sci Technol.* 2005; 121: 175-90.
- 205 Mosha TC, Gaga HE, Pace RD, Laswai HS, Mtebe K. Effect of blanching on the content of antinutritional factors in selected vegetables. *Plant Foods Hum Nutr.* 1995; 47: 361-67.
- 206 Naczk M, Amarowicz R, Pink D, Shahidi F. Insoluble condensed tannins of canola/rapeseed. *J Agric Food Chem.* 2000; 48: 1758-62.
- 207 Zrybko CL, Fukuda EK, Rosen RT. Determination of glucosinolates in domestic and wild mustard by high-performance liquid chromatography with confirmation by electrospray mass spectrometry and photodiode-array detection. *J Chromatogr A.* 1997; 767: 43-52.
- 208 Mithen RF. Glucosinolates and their degradation products. *Adv Bot Res.* 2001; 35: 213-32.
- 209 Brown J, Morra MJ. Glucosinolate-containing seed meal as a soil amendment to control plant pests. 2000-2002. University of Idaho: Idaho, Moscow 2005; 1-99.
- 210 Windsor AJ, Reichelt M, Figuth A, Svatos A, Kroymann J, Kliebenstein DJ, et al. Geographic and evolutionary diversification of glucosinolates among near relatives of *Arabidopsis thaliana* (Brassicaceae). *Phytochemistry.* 2005; 66: 1321-33.
- 211 Kushad MM, Brown AF, Kurilich AC, Juvik JA, Klein BP, Wallig MA, et al. Variation of glucosinolates in vegetable crops of *Brassica oleracea*. *J Agric Food Chem.* 1999; 47: 1541-48.
- 212 Iori R, Barillari J, Rollin P. Comment on In vitro gastrointestinal digestion study of broccoli inflorescence phenolic compounds, glucosinolates, and vitamin C. *J Agric Food Chem.* 2004; 52: 7432-33.
- 213 Rose P, Huang Q, Ong CN, Whiteman M. Broccoli and watercress suppress matrix metalloproteinase-9 activity and invasiveness of human MDA-MB-231 breast cancer cells. *Toxicol Appl Pharmacol.* 2005; 209: 105-13.
- 214 Rosa EAS. Glucosinolates from flower buds of Portuguese *Brassica* crops. *Phytochemistry.* 1997; 44: 1415-19.
- 215 Bradfield CA, Bjeldanes LF. Modification of carcinogen metabolism by indolylic autolysis products of *Brassica oleracea*. *Adv Exp Med Biol.* 1991; 289: 153-63.
- 216 Velisek J, Davidek J, Michova J, Pokorny J. Rapid gas chromatographic determination of volatile degradation products of glucosinolates in rapeseed oil. *J Chromatogr A.* 1990; 502: 167-70.
- 217 Smith TK, Lund EK, Clarke RG, Bennett RN, Johnson IT. Effects of Brussels sprout juice on the cell cycle and adhesion of human colorectal carcinoma cells (HT29) in vitro. *J Agric Food Chem.* 2005; 53: 3895-901.

- 218 Fenwick GR, Heaney RK. Glucosinolates and their breakdown products in cruciferous crops, foods and feedingstuffs. *Food Chem.* 1983; 11: 249-71.
- 219 Tripathi MK, Mishra AS. Glucosinolates in animal nutrition: A review. *Anim Feed Sci Technol.* 2007; 132: 1-27.
- 220 Luthy J, Carden B, Friederich U, Bachmann M. Goitrin - a nitrosatable constituent of plant foodstuffs. *Experientia.* 1984; 40: 452-53.
- 221 Verkerk R, Dekker M, Jongen WMF. Post-harvest increase of indolyl glucosinolates in response to chopping and storage of *Brassica* vegetables. *J Sci Food Agric.* 2001; 81: 953-58.
- 222 Kushad MM, Cloyd R, Babadoost M. Distribution of glucosinolates in ornamental cabbage and kale cultivars. *Sci Hortic.* 2004; 101: 215-21.
- 223 Cartea ME, Velasco P, Obregon S, Padilla G, de Haro A. Seasonal variation in glucosinolate content in *Brassica oleracea* crops grown in northwestern Spain. *Phytochemistry.* 2008; 69: 403-10.
- 224 Wittstock U, Halkier BA. Glucosinolate research in the *Arabidopsis* era. *Trends Plant Sci.* 2002; 7: 263-70.
- 225 Smith TJ, Yang CS. Effect of organosulfur compounds from garlic and cruciferous vegetables on drug metabolism enzymes. *Drug Metabol Drug Interact.* 2000; 17: 23-49.
- 226 Valette L, Fernandez X, Poulaing S, Lizzani-Cuvelier L, Loiseau A-M. Chemical composition of the volatile extracts from *Brassica oleracea* L. var. *botrytis* 'Romanesco' cauliflower seeds. *Flavour Fragr J.* 2006; 21: 107-10.
- 227 Kawanishi S, Oikawa S, Murata M. Evaluation for safety of antioxidant chemopreventive agents. *Antioxid Redox Signal.* 2005; 7: 1728-39.
- 228 Valette L, Fernandez X, Poulaing S, Loiseau AM, Lizzani-Cuvelier L, Levieil R, et al. Volatile constituents from Romanesco cauliflower. *Food Chem.* 2003; 80: 353-58.
- 229 Jacobsson A, Nielsen T, Sjoholm I. Influence of temperature, modified atmosphere packaging, and heat treatment on aroma compounds in broccoli. *J Agric Food Chem.* 2004; 52: 1607-14.
- 230 Griffiths DW, Deighton N, Birch ANE, Patrian B, Baur R, Städler E. Identification of glucosinolates on the leaf surface of plants from the Cruciferae and other closely related species. *Phytochemistry.* 2001; 57: 693-700.
- 231 Rosa EAS, Heaney RK, Fenwick GR, Portas CAM. Glucosinolates in crop plants. *Hortic Rev.* 1997; 19: 99-215.
- 232 Tierens KFMJ, Thomma BPHJ, Brouwer M, Schmidt J, Kistner K, Porzel A, et al. Study of the role of antimicrobial glucosinolate-derived isothiocyanates in resistance of *Arabidopsis* to microbial pathogens. *Plant Physiol.* 2001; 125: 1688-99.
- 233 de Saravia SGG, Gaylarde CC. The antimicrobial activity of an aqueous extract of *Brassica nigra*. *Int Biodeterior Biodegrad.* 1998; 41: 145-48.
- 234 Fahey JW, Talalay P. Antioxidant functions of sulforaphane: a potent inducer of phase II detoxication enzymes. *Food Chem Toxicol.* 1999; 37: 973-79.
- 235 Nagatsu A, Sugitani T, Mori Y, Okuyama H, Sakakibara J, Mizukami H. Antioxidants from rape (*Brassica campestris* var. *Japonica Hara*) oil cake. *Nat Prod Res.* 2004; 18: 231-9.

## References

- 236 Lund E. Non-nutritive bioactive constituents of plants: Dietary sources and health benefits of glucosinolates. *Int J Vitam Nutr Res.* 2003; 73.
- 237 Seow A, Yuan J-M, Sun C-L, Van Den Berg D, Lee H-P, Yu MC. Dietary isothiocyanates, glutathione S-transferase polymorphisms and colorectal cancer risk in the Singapore Chinese health study. *Carcinogenesis.* 2002; 23: 2055-61.
- 238 Ambrosone CB, McCann SE, Freudenheim JL, Marshall JR, Zhang Y, Shields PG. Breast cancer risk in premenopausal women is inversely associated with consumption of broccoli, a source of isothiocyanates, but is not modified by GST genotype. *J Nutr.* 2004; 134: 1134-38.
- 239 Tawfiq N, Heaney RK, Plumb JA, Fenwick GR, Musk SRR, Williamson G. Dietary glucosinolates as blocking agents against carcinogenesis: Glucosinolate breakdown products assessed by induction of quinone reductase activity in murine hepalc1c7 cells. *Carcinogenesis.* 1995; 16: 1191-94.
- 240 Liang H, Yuan Q, Xiao Q. Purification of sulforaphane from *Brassica oleracea* seed meal using low-pressure column chromatography. *J Chromatogr B.* 2005; 828: 91-96.
- 241 Branca F, Li G, Goyal S, Quiros CF. Survey of aliphatic glucosinolates in Sicilian wild and cultivated Brassicaceae. *Phytochemistry.* 2002; 59: 717-24.
- 242 Sato K, Kawakami N, Ohtsu T, Tsutsumi A, Miyazaki S, Masumoto T, et al. Broccoli consumption and chronic atrophic gastritis among Japanese males: an epidemiological investigation. *Acta Med Okayama.* 2004; 58: 127-33.
- 243 Hsu JC, Zhang J, Dev A, Wing A, Bjeldanes LF, Firestone GL. Indole-3-carbinol inhibition of androgen receptor expression and downregulation of androgen responsiveness in human prostate cancer cells. *Carcinogenesis.* 2005; 26: 1896-904.
- 244 Rahman KW, Sarkar FH. Inhibition of nuclear translocation of nuclear factor- $\kappa$ B contributes to 3,3'-diindolylmethane-induced apoptosis in breast cancer cells. *Cancer Res.* 2005; 65: 364-71.
- 245 Brignall MS. Prevention and treatment of cancer with indole-3-carbinol. *Altern Med Rev.* 2001; 6: 580-89.
- 246 Xue L, Schaldach CM, Janosik T, Bergman J, Bjeldanes LF. Effects of analogs of indole-3-carbinol cyclic trimerization product in human breast cancer cells. *Chem Biol Interact.* 2005; 152: 119-29.
- 247 Bruce TJ, Pickett JA. Plant defence signalling induced by biotic attacks. *Curr Opin Plant Biol.* 2007; 10: 387-92.
- 248 Verhoeven DTH, Verhagen H, Goldbohm RA, vandenBrandt PA, vanPoppel G. A review of mechanisms underlying anticarcinogenicity by *Brassica* vegetables. *Chem Biol Interact.* 1997; 103: 79-129.
- 249 Byers T, Perry G. Dietary carotenes, vitamin C, and vitamin E as protective antioxidants in human cancers. *Annu Rev Nutr.* 1992; 12: 139-59.
- 250 Griffiths DW, Birch ANE, Hillman JR. Antinutritional compounds in the *Brassicaceae*: Analysis, biosynthesis, chemistry and dietary effects. *J Hort Sci Biotechnol.* 1998; 73: 1-18.
- 251 Lotito SB, Frei B. Consumption of flavonoid-rich foods and increased plasma antioxidant capacity in humans: Cause, consequence, or epiphenomenon? *Free Radic Biol Med.* 2006; 41: 1727-46.

- 252 Hayat S, Ali B, Hasan SA, Ahmad A. Brassinosteroid enhanced the level of antioxidants under cadmium stress in *Brassica juncea*. *Environ Exp Bot.* 2007; 60: 33-41.
- 253 Schonhof I, Klaring HP, Krumbein A, Claussen W, Schreiner M. Effect of temperature increase under low radiation conditions on phytochemicals and ascorbic acid in greenhouse grown broccoli. *Agric Ecosyst Environ.* 2007; 119: 103-11.
- 254 Eason JR, Ryan D, Page B, Watson L, Coupe SA. Harvested broccoli (*Brassica oleracea*) responds to high carbon dioxide and low oxygen atmosphere by inducing stress-response genes. *Postharvest Biol Technol.* 2007; 43: 358-65.
- 255 Gols R, Raaijmakers CE, van Dam NM, Dicke M, Bukovinszky T, Harvey JA. Temporal changes affect plant chemistry and tritrophic interactions. *Basic Appl Ecol.* 2007; 8: 421-33.
- 256 Bellostas N, Sorensen AD, Sorensen JC, Sorensen H. Genetic variation and metabolism of glucosinolates. *Adv Bot Res.* 2007; 45: 369 - 415.
- 257 Petersen IL, Hansen HCB, Ravn HW, Sorensen JC, Sorensen H. Metabolic effects in rapeseed (*Brassica napus* L.) seedlings after root exposure to glyphosate. *Pestic Biochem Physiol.* 2007; 89: 220-29.
- 258 Shomerilan A, Jones GP, Paleg LG. Invitro thermal and salt stability of pyruvate-kinase are increased by proline analogs and trigonelline. *Aust J Plant Physiol.* 1991; 18: 279-86.
- 259 Rathinasabapathi B. Metabolic engineering for stress tolerance: Installing osmoprotectant synthesis pathways. *Ann Bot.* 2000; 86: 709-16.
- 260 Qasim M, Ashraf M, Ashraf MY, Rehman SU, Rha ES. Salt-induced changes in two canola cultivars differing in salt tolerance. *Biol Plant.* 2003; 46: 629-32.
- 261 Martinez-Ballesta MC, Martinez V, Carvajal M. Osmotic adjustment, water relations and gas exchange in pepper plants grown under NaCl or KCl. *Environ Exp Bot.* 2004; 52: 161-74.
- 262 Mattiacci L, Rocca BA, Scascighini N, D'Alessandro M, Hern A, Dorn S. Systemically induced plant volatiles emitted at the time of "danger". *J Chem Ecol.* 2001; 27: 2233-52.
- 263 Pedras MSC, Zheng QA, Gadagi RS, Rimmer SR. Phytoalexins and polar metabolites from the oilseeds canola and rapeseed: Differential metabolic responses to the biotroph *Albugo candida* and to abiotic stress. *Phytochemistry.* 2008; 69: 894-910.
- 264 Chinnusamy V, Schumaker K, Zhu JK. Molecular genetic perspectives on cross-talk and specificity in abiotic stress signalling in plants. *J Exp Bot.* 2004; 55: 225-36.
- 265 Bouchereau A, ClossaisBesnard N, Bensaoud A, Leport L, Renard M. Water stress effects on rapeseed quality. *Eur J Agron.* 1996; 5: 19-30.
- 266 Van Poecke RMP, Posthumus MA, Dicke M. Herbivore-induced volatile production by *Arabidopsis thaliana* leads to attraction of the parasitoid *Cotesia rubecula*: Chemical, behavioral, and gene-expression analysis. *J Chem Ecol.* 2001; 27: 1911-28.
- 267 Dicke M, van Poecke RMP, de Boer JG. Inducible indirect defence of plants: from mechanisms to ecological functions. *Basic Appl Ecol.* 2003; 4: 27-42.

## References

- 268 Cole RA. The relative importance of glucosinolates and amino acids to the development of two aphid pests *Brevicoryne brassicae* and *Myzus persicae* on wild and cultivated *Brassica species*. *Entomol Exp Appl.* 1997; 85: 121-33.
- 269 Mewis I, Appel HM, Hom A, Raina R, Schultz JC. Major signaling pathways modulate *Arabidopsis* glucosinolate accumulation and response to both phloem-feeding and chewing insects. *Plant Physiol.* 2005; 138: 1149-62.
- 270 Brandl MT. Fitness of human enteric pathogens on plants and implications for food safety. *Annu Rev Phytopathol.* 2006; 44: 367-92.
- 271 Good AG, Zaplachinski ST. The effects of drought stress on free amino-acid accumulation and protein-synthesis in *Brassica napus*. *Physiol Plant.* 1994; 90: 9-14.
- 272 Sasaki H, Ichimura K, Okada K, Oda M. Freezing tolerance and soluble sugar contents affected by water stress during cold-acclimation and de-acclimation in cabbage seedlings. *Sci Hortic.* 1998; 76: 161-69.
- 273 Singh S, Sinha S. Accumulation of metals and its effects in *Brassica juncea* (L.) Czern. (cv. Rohini) grown on various amendments of tannery waste. *Ecotoxicol Environ Saf.* 2005; 62: 118-27.
- 274 Zawoznik MS, Groppe MD, Tomaro ML, Benavides MP. Endogenous salicylic acid potentiates cadmium-induced oxidative stress in *Arabidopsis thaliana*. *Plant Sci.* 2007; 173: 190-97.
- 275 Xiong ZT, Liu C, Geng B. Phytotoxic effects of copper on nitrogen metabolism and plant growth in *Brassica pekinensis* Rupr. *Ecotoxicol Environ Saf.* 2006; 64: 273-80.
- 276 Seth CS, Chaturvedi PK, Misra V. The role of phytochelatins and antioxidants in tolerance to Cd accumulation in *Brassica juncea* L. *Ecotoxicol Environ Saf.* 2008; 71: 76-85.
- 277 Gebczynski P, Lisiewska Z. Comparison of the level of selected antioxidative compounds in frozen broccoli produced using traditional and modified methods. *Inn Food Sci Emerg Technol.* 2006; 7: 239-45.
- 278 Lisiewska Z, Kmiecik W, Korus A. The amino acid composition of kale (*Brassica oleracea* L. var. *acephala*), fresh and after culinary and technological processing. *Food Chem.* 2008; 108: 642-48.
- 279 Sikora E, Cieslik E, Leszczynska T, Filipiak-Florkiewicz A, Pisulewski PM. The antioxidant activity of selected cruciferous vegetables subjected to aquathermal processing. *Food Chem.* 2008; 107: 55-59.
- 280 Lemoine ML, Civello PM, Martinez GA, Chaves AR. Influence of postharvest UV-C treatment on refrigerated storage of minimally processed broccoli (*Brassica oleracea* var. *Italica*). *J Sci Food Agric.* 2007; 87: 1132-39.
- 281 Vallejo F, Garcia-Viguera C, Tomas-Barberan FA. Changes in broccoli (*Brassica oleracea* L. var. *italica*) health-promoting compounds with inflorescence development. *J Agric Food Chem.* 2003; 51: 3776-82.
- 282 Page T, Griffiths G, Buchanan-Wollaston V. Molecular and biochemical characterization of postharvest senescence in broccoli. *Plant Physiol.* 2001; 125: 718-27.
- 283 Hansen ME, Sorensen H, Cantwell M. Changes in acetaldehyde, ethanol and amino acid concentrations in broccoli florets during air and controlled atmosphere storage. *Postharvest Biol Technol.* 2001; 22: 227-37.

- 284 Chen S, Andreasson E. Update on glucosinolate metabolism and transport. *Plant Physiol Biochem.* 2001; 39: 743-58.
- 285 Halkier BA, Du LC. The biosynthesis of glucosinolates. *Trends Plant Sci.* 1997; 2: 425-31.
- 286 Padilla G, Cartea ME, Velasco P, de Haro A, Ordas A. Variation of glucosinolates in vegetable crops of *Brassica rapa*. *Phytochemistry.* 2007; 68: 536-45.
- 287 Martinez-Sanchez A, Allende A, Bennett RN, Ferreres F, Maria IG. Microbial, nutritional and sensory quality of rocket leaves as affected by different sanitizers. *Postharvest Biol Technol.* 2006; 42: 86-97.
- 288 Cieslik E, Leszczynska T, Filipiak-Florkiewicz A, Sikora E, Pisulewski PM. Effects of some technological processes on glucosinolate contents in cruciferous vegetables. *Food Chem.* 2007; 105: 976-81.
- 289 Song LJ, Thornalley PJ. Effect of storage, processing and cooking on glucosinolate content of *Brassica* vegetables. *Food Chem Toxicol.* 2007; 45: 216-24.
- 290 Xin-juan C, Zhu-jun Z, Xiao-lei N, Qong-qiu Q. Effect of nitrogen and sulfur supply on, glucosinolates in *Brassica campestris* ssp. *chinensis*. *Agr Sci China.* 2006; 8: 603-08.
- 291 van Poppel G, Verhoeven DTH, Verhagen H, Goldbohm RA. *Brassica* vegetables and cancer prevention - Epidemiology and mechanisms. In: Zappia VDFBARGLDR (ed.). Kluwer Academic / Plenum Publ: 1999; 159-68.
- 292 Doughty KJ, Porter AJR, Morton AM, Kiddie G, Bock CH, Wallsgrave R. Variation in the glucosinolate content of oilseed rape (*Brassica napus* L.) leaves II. Response to infection by *Alternaria brassicaceae* (berk) Sacc. *Ann Appl Biol.* 1991; 118: 469-77.
- 293 Burow M, Zhang ZY, Ober JA, Lambrix VM, Wittstock U, Gershenson J, et al. ESP and ESM1 mediate indol-3-acetonitrile production from indol-3-ylmethyl glucosinolate in *Arabidopsis*. *Phytochemistry.* 2008; 69: 663-71.
- 294 Martin N, Muller C. Induction of plant responses by a sequestering insect: Relationship of glucosinolate concentration and myrosinase activity. *Basic Appl Ecol.* 2007; 8: 13-25.
- 295 Lopez-Berenguer C, Martinez-Ballesta MC, Garcia-Viguera C, Carvajal M. Leaf water balance mediated by aquaporins under salt stress and associated glucosinolate synthesis in broccoli. *Plant Sci.* 2008; 174: 321-28.
- 296 Kliebenstein DJ, Figuth A, Mitchell-Olds T. Genetic architecture of plastic methyl jasmonate responses in *Arabidopsis thaliana*. *Genetics.* 2002; 161: 1685-96.
- 297 Mikkelsen MD, Petersen BL, Glawischnig E, Jensen AB, Andreasson E, Halkier BA. Modulation of CYP79 genes and glucosinolate profiles in *Arabidopsis* by defense signaling pathways. *Plant Physiol.* 2003; 131: 298-308.
- 298 Bodnaryk RP. Potent effect of jasmonates on indole glucosinolates in oilseed rape and mustard. *Phytochemistry.* 1994; 35: 301-05.
- 299 Mithen R. Glucosinolates - biochemistry, genetics and biological activity. *Plant Growth Regul.* 2001; 34: 91-103.

## References

- 300 Fenwick GR, Heaney RK, Mullin WJ. Glucosinolates and their breakdown products in food and food plants. *CRC Crit Rev Food Sci Nutr.* 1983; 18: 123-201.
- 301 Manici LM, Lazzeri L, Baruzzi G, Leoni O, Galletti S, Palmieri S. Suppressive activity of some glucosinolate enzyme degradation products on *Pythium irregularare* and *Rhizoctonia solani* in sterile soil. *Pest Manag Sci.* 2000; 56: 921-26.
- 302 Sisti M, Amagliani G, Brandi G. Antifungal activity of *Brassica oleracea* var. botrytis fresh aqueous juice. *Fitoterapia.* 2003; 74: 453-58.
- 303 Doughty KJ, Blight MM, Bock CH, Fieldsend JK, Pickett JA. Release of alkenyl isothiocyanates and other volatiles from *Brassica rapa* seedlings during infection by *Alternaria brassicaceae*. *Phytochemistry.* 1996; 43: 371-74.
- 304 Agrawal AA, Kurashige NS. A role for isothiocyanates in plant resistance against the specialist herbivore *Pieris rapae*. *J Chem Ecol.* 2003; 29: 1403-15.
- 305 Ludwig-Muller J, Schubert B, Pieper K, Ihmig S, Hilgenberg W. Glucosinolate content in susceptible and resistant Chinese cabbage varieties during development of clubroot disease. *Phytochemistry.* 1997; 44: 407-14.
- 306 van Dam NM, Raaijmakers CE. Local and systemic induced responses to cabbage root fly larvae (*Delia radicum*) in *Brassica nigra* and *B. oleracea*. *Chemoecology.* 2006; 16: 17-24.
- 307 Giamoustaris A, Mithen R. The effect of modifying the glucosinolate content of leaves of oilseed rape (*Brassica napus* Ssp. *Oleifera*) on its interaction with specialist and generalist pests. *Ann Appl Biol.* 1995; 126: 347-63.
- 308 Bodnaryk RP. Developmental profile of sinalbin (p-hydroxybenzyl glucosinolate) in mustard seedlings, *Sinapis alba* L, and its relationship to insect resistance. *J Chem Ecol.* 1991; 17: 1543-56.
- 309 Hopkins RJ, Ekbom B, Henkow L. Glucosinolate content and susceptibility for insect attack of three populations of *Sinapis alba*. *J Chem Ecol.* 1998; 24: 1203-16.
- 310 Bodnaryk RP. Effects of wounding on glucosinolates in the cotyledons of oilseed rape and mustard. *Phytochemistry.* 1992; 31: 2671-77.
- 311 Bartlet E, Kiddle G, Williams I, Wallsgrave R. Wound-induced increases in the glucosinolate content of oilseed rape and their effect on subsequent herbivory by a crucifer specialist. *Entomol Exp Appl.* 1999; 91: 163-67.
- 312 Mithen R, Clarke J, Lister C, Dean C. Genetics of aliphatic glucosinolates .III. side chain structure of aliphatic glucosinolates in *Arabidopsis thaliana*. *Heredity.* 1995; 74: 210-15.
- 313 Magrath R, Herron C, Giamoustaris A, Mithen R. The inheritance of aliphatic glucosinolates in *Brassica napus*. *Plant Breed.* 1993; 111: 55-72.
- 314 Giamoustaris A, Magrath R, Mithen R. Modifying the aliphatic glucosinolate content of oilseed rape and its effect upon pest and pathogen interactions. *Aspects Appl Biol.* 1994; 39: 125-32.
- 315 Spak J, Lewis J, Fenwick GR. Changes in the glucosinolate content of oilseed rape plants following infection with Turnip Mosaic-Virus. *Physiol Mol Plant Pathol.* 1993; 43: 437-42.
- 316 Menard R, Larue JP, Silue D, Thouvenot D. Glucosinolates in cauliflower as biochemical markers for resistance against downy mildew. *Phytochemistry.* 1999; 52: 29-35.

- 317 Moran PJ, Thompson GA. Molecular responses to aphid feeding in *Arabidopsis* in relation to plant defense pathways. *Plant Physiol.* 2001; 125: 1074-85.
- 318 Farwell AJ, Vesely S, Nero V, Rodriguez H, McCormack K, Shah S, et al. Tolerance of transgenic canola plants (*Brassica napus*) amended with plant growth-promoting bacteria to flooding stress at a metal-contaminated field site. *Environ Pollut.* 2007; 147: 540-45.
- 319 Leon-Kloosterziel KM, Verhagen BWM, Keurentjes JJB, VanPelt JA, Rep M, VanLoon LC, et al. Colonization of the *Arabidopsis rhizosphere* by fluorescent *Pseudomonas* spp. activates a root-specific, ethylene-responsive PR-5 gene in the vascular bundle. *Plant Mol Biol.* 2005; 57: 731-48.
- 320 Kiddle GA, Doughty KJ, Wallsgrove RM. Salicylic acid-Induced accumulation of glucosinolates in oilseed rape (*Brassica napus* L.) leaves. *J Exp Bot.* 1994; 45: 1343-46.
- 321 Doughty KJ, Kiddle GA, Pye BJ, Wallsgrove RM, Pickett JA. Selective induction of glucosinolates in oilseed rape leaves by methyl jasmonate. *Phytochemistry.* 1995; 38: 347-50.
- 322 Mollers C, Nehlin L, Glimelius K, Iqbal MCM. Influence of in vitro culture conditions on glucosinolate composition of microspore-derived embryos of *Brassica napus*. *Physiol Plant.* 1999; 107: 441-46.
- 323 Kaur S, Gupta SK, Sukhija PS, Munshi SK. Accumulation of glucosinolates in developing mustard (*Brassica juncea* L.) seeds in response to sulfur application. *Plant Sci.* 1990; 66: 181-84.
- 324 Kim SJ, Matsuo T, Watanabe M, Watanabe Y. Effect of nitrogen and sulphur application on the glucosinolate content in vegetable turnip rape (*Brassica rapa* L.). *Soil Sci Plant Nutr.* 2002; 48: 43-49.
- 325 Robbins RJ, Keck AS, Banuelos G, Finley JW. Cultivation conditions and selenium fertilization alter the phenolic profile, glucosinolate, and sulforaphane content of broccoli. *J Med Food.* 2005; 8: 204-14.
- 326 Volden J, Borge GIA, Bengtsson GB, Hansen M, Thygesen IE, Wicklund T. Effect of thermal treatment on glucosinolates and antioxidant-related parameters in red cabbage (*Brassica oleracea* L. ssp. *capitata* f. *rubra*). *Food Chem.* 2008; 109: 595-605.
- 327 Aksouh NM, Jacobs BC, Stoddard FL, Mailer RJ. Response of canola to different heat stresses. *Aust J Agric Res.* 2001; 52: 817-24.
- 328 Reifenrath K, Muller C. Species-specific and leaf-age dependent effects of ultraviolet radiation on two *Brassicaceae*. *Phytochemistry.* 2007; 68: 875-85.
- 329 McNaughton SA, Marks GC. Development of a food composition database for the estimation of dietary intakes of glucosinolates, the biologically active constituents of cruciferous vegetables. *Br J Nutr.* 2003; 90: 687-97.
- 330 Schone F, Kirchheim U, Schumann W. Glucosinolate degradation by rapeseed myrosinase and effect on rapeseed acceptability by growing pigs. *Anim Feed Sci Technol.* 1994; 48: 229-35.
- 331 Bones AM, Rossiter JT. The enzymic and chemically induced decomposition of glucosinolates. *Phytochemistry.* 2006; 67: 1053-67.
- 332 Force LE, O'Hare TJ, Wong LS, Irving DE. Impact of cold storage on glucosinolate levels in seed-sprouts of broccoli, rocket, white radish and kohlrabi. *Postharvest Biol Technol.* 2007; 44: 175-78.

## References

- 333 Winkler S, Faragher J, Franz P, Imsic M, Jones R. Glucoraphanin and flavonoid levels remain stable during simulated transport and marketing of broccoli (*Brassica oleracea* var. *italica*) heads. *Postharvest Biol Technol.* 2007; 43: 89-94.
- 334 Hansen M, Moller P, Sorensen H, de Trejo MC. Glucosinolates in broccoli stored under controlled-atmosphere. *J Am Soc Hortic Sci.* 1995; 120: 1069-74.
- 335 Pedras MSC, Jha M, Ahiahonu PWK. The synthesis and biosynthesis of phytoalexins produced by cruciferous plants. *Curr Org Chem.* 2003; 7: 1635-47.
- 336 Pedras ASC, Jha M, Minic Z, Okeola OG. Isosteric probes provide structural requirements essential for detoxification of the phytoalexin brassinin by the fungal pathogen *Leptosphaeria maculans*. *Bioorg Med Chem.* 2007; 15: 6054-61.
- 337 Pedras MSC, Ahiahonu PWK. Metabolism and detoxification of phytoalexins and analogs by phytopathogenic fungi. *Phytochemistry.* 2005; 66: 391-411.
- 338 Soylu S. Accumulation of cell-wall bound phenolic compounds and phytoalexin in *Arabidopsis thaliana* leaves following inoculation with pathovars of *Pseudomonas syringae*. *Plant Sci.* 2006; 170: 942-52.
- 339 Conn KL, Tewari JP, Dahiya JS. Resistance to *Alternaria brassicae* and phytoalexin elicitation in rapeseed and other crucifers. *Plant Sci.* 1988; 56: 21-25.
- 340 Zook M, Leege L, Jacobson D, Hammerschmidt R. Camalexin accumulation in *Arabis lyrata*. *Phytochemistry.* 1998; 49: 2287-89.
- 341 Pedras MSC, Chumala PB, Suchy M. Phytoalexins from *Thlaspi arvense*, a wild crucifer resistant to virulent *Leptosphaeria maculans*: structures, syntheses and antifungal activity. *Phytochemistry.* 2003; 64: 949-56.
- 342 Dahiya JS, Rimmer SR. Phytoalexin accumulation in tissues of *Brassica napus* inoculated with *Leptosphaeria maculans*. *Phytochemistry.* 1988; 27: 3105-07.
- 343 Pedras MSC, Smith KC. Sinalexin, a phytoalexin from white mustard elicited by destruxin B and *Alternaria brassicae*. *Phytochemistry.* 1997; 46: 833-37.
- 344 Pedras MSC, Ahiahonu PWK. Phytotoxin production and phytoalexin elicitation by the phytopathogenic fungus *Sclerotinia sclerotiorum*. *J Chem Ecol.* 2004; 30: 2163-79.
- 345 Pedras MSC, Montaut S, Suchy M. Phytoalexins from the crucifer rutabaga: Structures, syntheses, biosyntheses, and antifungal activity. *J Org Chem.* 2004; 69: 4471-76.
- 346 Pedras MSC, Sarwar MG, Suchy M, Adio AM. The phytoalexins from cauliflower, caulilexins A, B and C: Isolation, structure determination, syntheses and antifungal activity. *Phytochemistry.* 2006; 67: 1503-09.
- 347 Van-Etten HD, Sandrock RW, Wasemann CC, Soby SD, McCluskey K, Wang P. Detoxification of phytoanticipins and phytoalexins by phytopathogenic fungi. *Nat Res Council Ca.* 1995; S518-S25.
- 348 Rouxel T, Kollmann A, Boulidard L, Mithen R. Abiotic elicitation of indole phytoalexins and resistance to *Leptosphaeria maculans* within *Brassicaceae*. *Planta.* 1991; 184: 271-78.
- 349 Kusznierekowicz B, Smiechowska A, Bartoszek A, Namiesnik J. The effect of heating and fermenting on antioxidant properties of white cabbage. *Food Chem.* 2008; 108: 853-61.

- 350 Sousa C, Pereira DM, Pereira JA, Bento A, Rodrigues MA, Dopico-Garcia S, et al. Multivariate analysis of tronchuda cabbage (*Brassica oleracea* L. var. *costata* DC) phenolics: Influence of fertilizers. *J Agric Food Chem.* 2008; 56: 2231-39.
- 351 Grace SC, Logan BA. Energy dissipation and radical scavenging by the plant phenylpropanoid pathway. *Phil Trans Royal Soc Lon Ser B-Biol Sci.* 2000; 355: 1499-510.
- 352 Vereecke D, Messens E, Klarskov K, DeBruyn A, VanMontagu M, Goethals K. Patterns of phenolic compounds in leafy galls of tobacco. *Planta.* 1997; 201: 342-48.
- 353 Miles PW. Aphid saliva. *Biol Rev.* 1999; 74: 41-85.
- 354 Liang YS, Kim HK, Lefeber AWM, Erkelens C, Choi YH, Verpoorte R. Identification of phenylpropanoids in methyl jasmonate treated *Brassica rapa* leaves using two-dimensional nuclear magnetic resonance spectroscopy. *J Chromatogr A.* 2006; 1112: 148-55.
- 355 Mobin M, Khan NA. Photosynthetic activity, pigment composition and antioxidative response of two mustard (*Brassica juncea*) cultivars differing in photosynthetic capacity subjected to cadmium stress. *J Plant Physiol.* 2007; 164: 601-10.
- 356 Gidda SK, Varin L. Biochemical and molecular characterization of flavonoid 7-sulfotransferase from *Arabidopsis thaliana*. *Plant Physiol Biochem.* 2006; 44: 628-36.
- 357 Vallejo F, Tomas-Barberan FA, Garcia-Viguera C. Effect of climatic and sulphur fertilisation conditions, on phenolic compounds and vitamin C, in the inflorescences of eight broccoli cultivars. *Eur Food Res Technol.* 2003; 216: 395-401.
- 358 Gitz DC, Liu L, McClure JW. Phenolic metabolism, growth, and UV-B tolerance in phenylalanine ammonia-lyase-inhibited red cabbage seedlings. *Phytochemistry.* 1998; 49: 377-86.
- 359 Olsson LC, Veit M, Weissenbock G, Bornman JF. Differential flavonoid response to enhanced UV-B radiation in *Brassica napus*. *Phytochemistry.* 1998; 49: 1021-28.
- 360 Wilson KE, Thompson JE, Huner NPA, Greenberg BM. Effects of ultraviolet-A exposure on ultraviolet-B-induced accumulation of specific flavonoids in *Brassica napus*. *Photochem Photobiol.* 2001; 73: 678-84.
- 361 Lo Scalzo R, Genna A, Branca F, Chedin M, Chassaigne H. Anthocyanin composition of cauliflower (*Brassica oleracea* L. var. *botrytis*) and cabbage (*B. oleracea* L. var. *capitata*) and its stability in relation to thermal treatments. *Food Chemistry.* 2008; 107: 136-44.
- 362 Krishna P. Brassinosteroid-mediated stress responses. *J Plant Growth Regul.* 2003; 22: 289-97.
- 363 Kagale S, Divi UK, Krochko JE, Keller WA, Krishna P. Brassinosteroid confers tolerance in *Arabidopsis thaliana* and *Brassica napus* to a range of abiotic stresses. *Planta.* 2007; 225: 353-64.
- 364 Janeczko A, Koscielniak J, Pilipowicz M, Szarek-Lukaszewska G, Skoczowski A. Protection of winter rape photosystem 2 by 24-epibrassinolide under cadmium stress. *Photosynthetica.* 2005; 43: 293-98.

## References

- 365 Fujioka S, Yokota T. Biosynthesis and metabolism of brassinosteroids. *Annu Rev Plant Biol.* 2003; 54: 137-64.
- 366 Dhaubhadel S, Chaudhary S, Dobinson KF, Krishna P. Treatment with 24-epibrassinolide, a brassinosteroid, increases the basic thermostolerance of *Brassica napus* and tomato seedlings. *Plant Mol Biol.* 1999; 40: 333-42.
- 367 Rouleau M, Marsolais F, Richard M, Nicolle L, Voigt B, Adam G, *et al.* Inactivation of brassinosteroid biological activity by a salicylate-inducible steroid sulfotransferase from *Brassica napus*. *J Biol Chem.* 1999; 274: 20925-30.
- 368 Anuradha S, Rao SSR. The effect of brassinosteroids on radish (*Raphanus sativus* L.) seedlings growing under cadmium stress. *Plant Soil Environ.* 2007; 53: 465-72.
- 369 Zhao-liang L, Li-wang L, Xiao-yan L, Yi-qin G, Xi-lin H, Xian-wen Z, *et al.* Analysis and evaluation of nutritional quality in chinese radish (*Raphanus sativus* L.). *Agri Sci China.* 2008; 7: 823-30.
- 370 Klinger T, Elam DR, Ellstrand NC. Radish as a model system for the study of engineered gene escape rates via crop-weed mating. *Conserv Biol.* 1991; 5: 531-35.
- 371 Jahangir M, Kim HK, Choi YH, Verpoorte R. Health-affecting compounds in *Brassicaceae*. *Comp Rev Food Sci Food Saf.* 2009; 8: 31-43.
- 372 van Dam NM, Raaijmakers CE, van der Putten WH. Root herbivory reduces growth and survival of the shoot feeding specialist *Pieris rapae* on *Brassica nigra*. *Entomol Exp Appl.* 2005; 115: 161-70.
- 373 Helsper JPFG, de Vos CHR, Maas FM, Jonker HH, van den Broeck HC, Jordi W, *et al.* Response of selected antioxidants and pigments in tissues of *Rosa hybrida* and *Fuchsia hybrida* to supplemental UV-A exposure. *Physiol Plant.* 2003; 117: 171-78.
- 374 Bino RJ, de Vos CHR, Lieberman M, Hall RD, Bovy A, Jonker HH, *et al.* The light-hyperresponsive high pigment-2<sup>dg</sup> mutation of tomato: alterations in the fruit metabolome. *New Phytol.* 2005; 166: 427-38.
- 375 Thomas H, Stoddart JL. Leaf senescence. *Annu Rev Plant Phys.* 1980; 31: 83-111.
- 376 Iwasa Y, Kubo T, van Dam N, de Jong TJ. Optimal level of chemical defense decreasing with leaf age. *Theor Popul Biol.* 1996; 50: 124-48.
- 377 Bloom AJ, Chapin FS, Mooney HA. Resource limitation in plants - An economic analogy. *Annu Rev Ecol Syst.* 1985; 16: 363-92.
- 378 Beuchat LR. Vectors and conditions for preharvest contamination of fruits and vegetables with pathogens capable of causing enteric diseases. *Br Food J.* 2006; 108: 38-53.
- 379 Ingham SC, Losinski JA, Andrews MP, Breuer JE, Breuer JR, Wood TM, *et al.* *Escherichia coli* contamination of vegetables grown in soils fertilized with noncomposted bovine manure: Garden-scale studies. *Appl Environ Microbiol.* 2004; 70: 6420-27.
- 380 Chui VWD, Lam-Leung SY, Cheung M, Wu VKC. The use of sewage sludge as basal dressing for vegetable cultivation. *Environ Int.* 1992; 18: 201-09.
- 381 Anderson GL, Kenney SJ, Millner PD, Beuchat LR, Williams PL. Shedding of foodborne pathogens by *Caenorhabditis elegans* in compost-amended and unamended soil. *Food Microbiol.* 2006; 23: 146-53.

- 382 Duarte IF, Delgadillo I, Gil AM. Study of natural mango juice spoilage and microbial contamination with *Penicillium expansum* by high resolution  $^1\text{H}$  NMR spectroscopy. *Food Chem.* 2006; 96: 313-24.
- 383 Dangle JL, Jones JDG. Plant pathogens and integrated defense responses to infection. *Nature.* 2001; 411: 826-33.
- 384 Buck JW, Walcott RR, Beuchat LR. Recent trends in microbiological safety of fruits and vegetables. *Online: Plant Health Progress doi: 101094/PHP-2003-0121-01-RV.* 2003.
- 385 Hirano SS, Upper CD. Bacteria in the leaf ecosystem with emphasis on *Pseudomonas syringae* - a pathogen, ice nucleus, and epiphyte. *Microbiol Mol Biol Rev.* 2000; 64: 624-53.
- 386 Wachtel MR, Whitehand LC, Mandrell RE. Prevalence of *Escherichia coli* associated with a cabbage crop inadvertently irrigated with partially treated sewage wastewater. *J Food Prot.* 2002; 65: 471-75.
- 387 Banerjee M, Sarkar PK. Microbiological quality of some retail spices in India. *Food Res Int.* 2003; 36: 469-74.
- 388 Choi YH, Kim HK, Hazekamp A, Erkelens C, Lefeber AWM, Verpoorte R. Metabolomic differentiation of *Cannabis sativa* cultivars using  $^1\text{H}$  NMR spectroscopy and principal component analysis. *J Nat Prod.* 2004; 67: 953-57.
- 389 Murashige T, Skoog F. A revised medium for rapid growth and bioassays with tobacco tissue cultures. *Physiol Plant.* 1962; 15: 473-97.
- 390 Ryu C-M, Farag MA, Hu C-H, Reddy MS, Kloepper JW, Pare PW. Bacterial volatiles induce systemic resistance in *Arabidopsis*. *Plant Physiol.* 2004; 134: 1017-26.
- 391 Mehdy MC. Active oxygen species in plant defense against pathogens. *Plant Physiol.* 1994; 105: 467-72.
- 392 Vaquero MJR, Alberto MR, de Nadra MCM. Antibacterial effect of phenolic compounds from different wines. *Food Control.* 2007; 18: 93-101.
- 393 Williamson G, Day AJ, Plumb GW, Couteau D. Human metabolic pathways of dietary flavonoids and cinnamates. *Biochem Soc Trans.* 2000; 28: 16-22.
- 394 Boquet P, Lemichez E. Bacterial virulence factors targeting Rho GTPases: Parasitism or symbiosis? *Trends Cell Biol.* 2003; 13: 238-46.
- 395 Hodges CF, Robinson PW. Sugar and amino acid content of *Poa pratensis* infected with *Ustilago striiformis* and *Urocystis agropyri*. *Physiol Plant.* 1977; 41: 25-28.
- 396 Beuve N, Rispail N, Laine P, Cliquet J-B, Ourry A, Le Deunff E. Putative role of  $\gamma$ -aminobutyric acid (GABA) as a long-distance signal in up-regulation of nitrate uptake in *Brassica napus* L. *Plant Cell Environ.* 2004; 27: 1035-46.
- 397 Mahuku GS, Hall R, Goodwin PH. Co-infection and induction of systemic acquired resistance by weakly and highly virulent isolates of *Leptosphaeria maculans* in oilseed rape. *Physiol Mol Plant Pathol.* 1996; 49: 61-72.
- 398 Lee M-K, Kim H-S, Kim J-S, Kim S-H, Park Y-D. Agrobacterium-mediated transformation system for large-scale production of transgenic chinese cabbage (*Brassica rapa* L. ssp. *pekinensis*) plants for insertional mutagenesis. *J Plant Biol.* 2004; 47: 300-06.
- 399 Widarto HT, Van Der Meijden E, Lefeber AWM, Erkelens C, Kim HK, Choi YH, et al. Metabolomic differentiation of *Brassica rapa* following herbivory

## References

- by different insect instars using two-dimensional nuclear magnetic resonance spectroscopy. *J Chem Ecol.* 2006; 32: 2417-28.
- 400 Bellotas N, Kachlicki P, Sorensen JC, Sorensen H. Glucosinolate profiling of seeds and sprouts of *B. oleracea* varieties used for food. *Sci Hortic.* 2007; 114: 234-42.
- 401 Grispen VMJ, Nelissen HJM, Verkleij JAC. Phytoextraction with *Brassica napus* L.: A tool for sustainable management of heavy metal contaminated soils. *Environ Pollut.* 2006; 144: 77-83.
- 402 Galan E, Gomez-Ariza JL, Gonzalez I, Fernandez-Caliani JC, Morales E, Giraldez I. Heavy metal partitioning in river sediments severely polluted by acid mine drainage in the Iberian Pyrite Belt. *Appl Geochem.* 2003; 18: 409-21.
- 403 Gisbert C, Clemente R, Navarro-Avino J, Baixaulli C, Giner A, Serrano R, et al. Tolerance and accumulation of heavy metals by *Brassicaceae* species grown in contaminated soils from Mediterranean regions of Spain. *Environ Exp Bot.* 2006; 56: 19-27.
- 404 Van Engelen DL, Sharpe-Pedler RC, Moorhead KK. Effect of chelating agents and solubility of cadmium complexes on uptake from soil by *Brassica juncea*. *Chemosphere.* 2007; 68: 401-08.
- 405 DeGara L, dePinto M, Locato V. Changes in the ascorbate metabolism during programmed cell death and moderate oxidative stress in TBY-2 cells. *Comp Biochem Physiol Part A Mol Integr Physiol.* 2007; 146: S261-S61.
- 406 Cobbett CS. Phytochelatins and their roles in heavy metal detoxification. *Plant Physiol.* 2000; 123: 825-32.
- 407 Narula A, Kumar S, Srivastava PS. Abiotic metal stress enhances diosgenin yield in *Dioscorea bulbifera* L. cultures. *Plant Cell Rep.* 2005; 24: 250-54.
- 408 Mithofer A, Schulze B, Boland W. Biotic and heavy metal stress response in plants: Evidence for common signals. *FEBS Lett.* 2004; 566: 1-5.
- 409 Psotova J, Lasovsky J, Vicar J. Metal chelating properties, electrochemical behaviour, scavenging and cytoprotective activities of six natural phenolics. *Biomedical Paper.* 2003; 147: 147-53.
- 410 Saeed AI, Sharov V, White J, Li J, Liang W, Bhagabati N, et al. TM4: A free, open-source system for microarray data management and analysis. *Biotechniques.* 2003; 34: 374-78.
- 411 Guo TR, Zhang GP, Zhang YH. Physiological changes in barley plants under combined toxicity of aluminum, copper and cadmium. *Colloid Surface B.* 2007; 57: 182-88.
- 412 Memon AR, Aktoprakligul D, Zdemur A, Vertii A. Heavy metal accumulation and detoxification mechanisms in plants. *Turk J Bot.* 2001; 25: 111-21.
- 413 Sablani SS. Drying of fruits and vegetables: Retention of nutritional/functional quality. *Drying Technol.* 2006; 24: 123-35.
- 414 Bahcecii KS, Serpen A, Gokmen V, Acar J. Study of lipoxygenase and peroxidase as indicator enzymes in green beans: change of enzyme activity, ascorbic acid and chlorophylls during frozen storage. *J Food Eng.* 2005; 66: 187-92.
- 415 Toor RK, Savage GP. Changes in major antioxidant components of tomatoes during post-harvest storage. *Food Chem.* 2006; 99: 724-27.

- 416 Asami DK, Hong YJ, Barrett DM, Mitchell AE. Processing-induced changes in total phenolics and procyanidins in clingstone peaches. *J Sci Food Agric.* 2003; 83: 56-63.
- 417 del Aguila JS, Sasaki FF, Heiffig LS, Ortega EMM, Jacomino AP, Kluge RA. Fresh-cut radish using different cut types and storage temperatures. *Postharvest Biol Technol.* 2006; 40: 149-54.
- 418 Mattana M, Biazzi E, Consonni R, Locatelli F, Vannini C, Provera S, et al. Overexpression of Osmyb4 enhances compatible solute accumulation and increases stress tolerance of *Arabidopsis thaliana*. *Physiol Plant.* 2005; 125: 212-23.
- 419 Ciska E, Honke J, Kozlowska H. Effect of light conditions on the contents of glucosinolates in germinating seeds of white mustard, red radish, white radish, and rapeseed. *J Agric Food Chem.* 2008; 56: 9087-93.
- 420 Kujala TS, Loponen JM, Klika KD, Pihlaja K. Phenolics and betacyanins in red beetroot (*Beta vulgaris*) root: Distribution and effect of cold storage on the content of total phenolics and three individual compounds. *J Agric Food Chem.* 2000; 48: 5338-42.
- 421 Chattopadhyay SB, Sahu PK, Thapa U, Niranjan KM. Effect of microbial amendments on root and seed yield of radish. *J Vegetable Sci* 2007; 12: 89-104
- 422 Martínez-Villaluenga C, Frias J, Gulewicz P, Gulewicz K, Vidal-Valverde C. Food safety evaluation of broccoli and radish sprouts. *Food Chem Toxicol.* 2008; 46: 1635-44.
- 423 Kostkarick R, Manning WJ. Radish (*Rapahus sativus* L) - A model for studying plant responses to air pollutants and other environmental stresses. *Environ Pollut.* 1993; 82: 107-38.
- 424 Hegde SG, Nason JD, Clegg JM, Ellstrand NC. The evolution of California's wild radish has resulted in the extinction of its progenitors. *Evolution.* 2006; 60: 1187-97.
- 425 Keppler K, Humpf HU. Metabolism of anthocyanins and their phenolic degradation products by the intestinal microflora. *Bioorg Med Chem.* 2005; 13: 5195-205.
- 426 Vassilakis C, Pantidou A, Psillakis E, Kalogerakis N, Mantzavinos D. Sonolysis of natural phenolic compounds in aqueous solutions: Degradation pathways and biodegradability. *Water Res.* 2004; 38: 3110-18.
- 427 Buskov S, Hansen LB, Olsen CE, Sorensen JC, Sorensen H, Sorensen S. Determination of ascorbigens in autolysates of various *Brassica* species using supercritical fluid chromatography. *J Agric Food Chem.* 2000; 48: 2693-701.
- 428 Hrcnirik K, Valusek J, Velisek J. Investigation of ascorbigen as a breakdown product of glucobrassicin autolysis in *Brassica* vegetables. *Eur Food Res Technol.* 2001; 212: 576-81.
- 429 Fiehn O, Kopka J, Dormann P, Altmann T, Trethewey RN, Willmitzer aL. Metabolite profiling for plant functional genomics. *Nature Biotech.* 2000; 18: 1157-61.
- 430 Ian Kaplan RH, Andre Kessler, Brian J. Rehill, Sandra Sardanelli, Robert F. Denno,. Physiological integration of roots and shoots in plant defense strategies links above- and belowground herbivory. *Ecology Letters.* 2008; 11: 841-51.

## References

- 431 Kim SJ, Ishii G. Effect of storage temperature and duration on glucosinolate, total vitamin C and nitrate contents in rocket salad (*Eruca sativa* Mill.). *J Sci Food Agric.* 2007; 87: 966-73.
- 432 Galindo FG, Herppich W, Gekas V, Sjoholm I. Factors affecting quality and postharvest properties of vegetables: Integration of water relations and metabolism. *Crit Rev Food Sci Nutr.* 2004; 44: 139 - 54.
- 433 Danyluk J, Perron A, Houde M, Limin A, Fowler B, Benhamou N, *et al.* Accumulation of an acidic dehydrin in the vicinity of the plasma membrane during cold acclimation of wheat. *Plant Cell.* 1998; 10: 623-38.
- 434 Bednarek P, Schneider B, Svatos A, Oldham NJ, Hahlbrock K. Structural complexity, differential response to infection, and tissue specificity of indolic and phenylpropanoid secondary metabolism in *Arabidopsis* roots. *Plant Physiol.* 2005; 138: 1058-70.
- 435 Rhee IK, van de Meent M, Ingkaninan K, Verpoorte R. Screening for acetylcholinesterase inhibitors from *Amaryllidaceae* using silica gel thin-layer chromatography in combination with bioactivity staining. *J Chromatogr A.* 2001; 915: 217-23.
- 436 Rhee IK, van Rijn RM, Verpoorte R. Qualitative determination of false-positive effects in the acetylcholinesterase assay using thin layer chromatography. *Phytochem Anal.* 2003; 14: 127-31.
- 437 Ingkaninan K, de Best CM, van der Heijden R, Hofte AJP, Karabatak B, Irth H, *et al.* High-performance liquid chromatography with on-line coupled UV, mass spectrometric and biochemical detection for identification of acetylcholinesterase inhibitors from natural products. *J Chromatogr A.* 2000; 872: 61-73.
- 438 In Kyung Rhee NA, Teus Luijendijk, Hubertus Irth, Robert Verpoorte,. Determining acetylcholinesterase inhibitory activity in plant extracts using a fluorimetric flow assay. *Phytochem. Anal.* 2003; 14: 145-49.
- 439 Yuliana ND, Khatib A, Link-Struensee AMR, IJzerman AP, Choi YH, Verpoorte R. Adenosine A1 receptor binding activity of methoxy flavonoids from *Orthosiphon stamineus*. *Planta Med.* 2009; 75: 132-6.
- 440 Horswill JG, Bali U, Shaaban S, Keily JF, Jeevaratnam P, Babbs AJ, *et al.* PSNCBAM-1, a novel allosteric antagonist at cannabinoid CB<sub>1</sub> receptors with hypophagic effects in rats. *Br J Pharmacol.* 2007; 152: 805-14.
- 441 Devienne KF, Raddi MSG. Screening for antimicrobial activity of natural products using a microplate photometer. *Braz J Microbiol.* 2002; 33: 166-68.
- 442 Mukherjee PK, Kumar V, Mal M, Houghton PJ. Acetylcholinesterase inhibitors from plants. *Phytomedicine.* 2007; 14: 289-300.
- 443 Rhee IK, Appels N, Luijendijk T, Irth H, Verpoorte R. Determining acetylcholinesterase inhibitory activity in plant extracts using a fluorimetric flow assay. *Phytochem Anal.* 2003; 14: 145-49.
- 444 Ingkaninan K, von Frijtag Drabbe Kunzel JK, Ijzerman AP, Verpoorte R. Interference of linoleic acid fraction in some receptor binding assays. *J Nat Prod.* 1999; 62: 912-14.
- 445 Tikunov Y, Lommen A, de Vos CHR, Verhoeven HA, Bino RJ, Hall RD, *et al.* A novel approach for nontargeted data analysis for metabolomics. Large-scale profiling of tomato fruit volatiles. *Plant Physiol.* 2005; 139: 1125-37.