

Bibliography

- Adisakwattana, S., Sompong, W., Meeprom, A., Ngamukote, S. and Yibchok-anun, S. 2012. Cinnamic acid and its derivatives inhibit fructose-mediated protein glycation. *Int. J. Mol. Sci.* 13:1778–1789.
- Aebi, H. E. 1983. Catalase. In “Method of Enzymatic analysis”, VCH, Weinheim, Germany - Deerfield, FL.3:273-286
- Amanullah, M. M., Sekar, S. and Vincent, S. 2010. Plant growth substances in crop production: A Review. *Asian Journal of Plant Sciences.* 9(4):215–222.
- Andrade-Ochoa, S., Nevarez-Moorillon, G. V., Sanchez-Torres, L. E., Villanueva-Garcia, M. Sanchez-Ramírez, B. E., Rodriguez-Valdez, L. M. and Rivera-Chavira, B. E. 2015. Quantitative structure-activity relationship of molecules constituent of different essential oils with anti-mycobacterial activity against *Mycobacterium tuberculosis* and *Mycobacterium bovis*. *BMC Complement Altern. Med.* 23(1):332.
- Anslow, P. A. and Stratford, M. 2000. Preservative and flavoring system. U. S. patent. 6,042,861.
- Apte, P.V. and Laloraya, M. M. 1982. Inhibitory action of phenolic compounds on ABA induced abscission. *J. Exp. Bot.* 35:826–830.
- Arnon, D. J. 1949. Copper enzymes in isolated chloroplasts. Polyphenol oxidase in *Beta vulgaris*. *Plant physiol.*, 24; 1-5
- Arteca, R. N. 1996. Plant growth substances: principles and applications. New York: Chapman and Hall.
- Backes, M., Obst, K., Bojahr, J., Thorhauer, A., Roudnitzky, N., Paetz, S., Reichelt, K. V., Krammer, G. E., Meyerhof, W. and Ley, J. P. 2015. Rubemamine and Rubescenamine: Two naturally occurring N-cinnamoylphenethylamines with umami-taste-modulating properties. *J. Agric. Food. Chem.* 24: 63(39) 8694–704.
- Balasimher, D., Ram, C. and Tiwari, M. N. 1977. Cytokinin-coumarin interaction in relation to growth, sulfhydryl, chlorophylls, and peroxidase activity in *Phaseolus radiatus* L. seedling. *Biochem. Physiol.* 171:49–54.
- Balentine, D. A., Wiseman, S. A. and Bouwens, L. C. M. 1997. The chemistry of tea flavonoids. *Crit. Rev. Plant Sci.* 37:693–704.

- Baleroni, C. R. S., Ferrarese, M. L. L., Souza, N. E. and Ferrarese, F. 2000. Lipid accumulation during canola seed germination in response to cinnamic acid derivatives. *Biol. Plant.* 43:313–316.
- Ballhorn, D. J., Kautz, S., Heil, M. and Hegeman, A. D. 2009. Cyanogenesis of wild lima bean (*Phaseolus lunatus* L.) is an efficient direct defence in nature. *Plant Signaling and Behavior.* 4(8):735–745.
- Bandara, B. M. R., Hewage, C. M., Karunaratne, V. and Adikaram, N. K. B. 1988. Methyl-ester of *p*-coumaric acid: Antifungal principle of the rhizome of *Costus speciosus*. *Planta Med.* 54:477–478.
- Barkosky, R. R., Butler, J. L. and Einhellig, F. A. 2000. Caffeic acid-induced changes in plant water relationships and photosynthesis in leafy spurge. *J. Chem. Ecol.* 26(9):2095–2109.
- Bartwal, A., Mall, R., Lohani, P., Guru, S. K. and Arora, S. 2013. Role of secondary metabolites and brassinosteroids in plant defense against environmental stresses. *J. Plant Growth Regul.* 32:216–232.
- Batish, D. R., Singh, H. P., Kaur, S., Kohli, R. K. and Yadav, S. S. 2008. Caffeic acid affects early Growth and morphogenetic response of hypocotyl cuttings of mung bean (*Phaseolus aureus*). *J. Plant Physiol.* 165:297–305.
- Beloborodova, N., Bairamov, I., Olenin, A., Shubina, V., Teplova, V. and Fedotcheva, B. 2012. Effect of phenolic acids of microbial origin on production of reactive oxygen species in mitochondria and neutrophils. *Journal of Biomedical Science.* 19:89.
- Bernards, M. A., Lopez, M. L., Zajicek, J. and Lewis, N. G. 1995. Hydroxycinnamic acid derived polymers constitute the polyaromatic domain of suberin. *Journal of Biological Chemistry.* 270:7382–7386.
- Bi, C. L., Fang, C., Jackson, L., Gill, B. S. and Li, W. L. 2011. Expression of lignin biosynthetic genes in wheat during development and upon infection by fungal pathogens. *Plant Mol. Biol. Report.* 29:149–161.
- Bisogno, F., Mascoti, L., Sanchez, C., Garibotto, F., Giannino, F., Kurina-Sanz, M. and Enriz, R. 2007. *J. Agric. Food Chem.* 55:10635–10640.
- Blum, U. and Gerig, T. M. 2006. Interrelationships between *p*-coumaric acid, evapotranspiration, soil water content, and leaf expansion. *J. Chem. Ecol.* 32:1817–1834.

- Boerjan, W., Ralph, J. and Baucher, M. 2003. Lignin biosynthesis. *Annual Review of Plant Biology*. 54:519–546.
- Bottcher, C., Roepenack-Lahaye, V. E., Schmidt, J., Schmotz, C., Neumann, S., Scheel, D. and Clemens, S. 2008. Metabolome analysis of biosynthetic mutants reveals a diversity of metabolic changes and allows identification of a large number of new compounds in *Arabidopsis*. *Plant Physiol*. 147:2107–2120.
- Boudet A. M. 2007. Evolution and current status of research in phenolic compounds. *Phytochemistry*. 68:2722–35.
- Braun, J. and Tevini, M. 1993. Regulation of UV-protective pigment synthesis in the epidermal layer of rye seedlings. *Photochem. Photobiol*. 57:318–323.
- Bubna, G. A., Lima, R. B., Zanardo, D. Y. L., Santos, W. D., Ferrarese, M. L. L. and Ferrarese - F. O. 2011. Exogenous caffeic acid inhibits the growth and enhances the lignification of the roots of soybean (*Glycine max*). *Journal of Plant Physiology*. 168:1627–1633.
- Buer, C. S., Imin, N. and Djordjevic, M. A. 2010. Flavonoids: new roles for old molecules. *J. Integr. Plant Biol*. 52:98–111.
- Catanzaro, D., Vianello, C., Ragazzi, E., Caparrotta, L. and Montopoli, M. 2014. Cell cycle control by natural phenols in cisplatin-resistant cell lines. *Nat. Prod. Commun*. 9(10):1465–8.
- Chambel, A., Viegas, C. A. and Sa-Correia, I. 1999. Effect of cinnamic acid on the growth and on plasma membrane H⁺-ATPase activity of *Saccharomyces cerevisiae*. *International Journal of Food Microbiology*. 50:173–179.
- Chapple, C. C., Vogt, T., Ellis, B. E. and Somerville, C. R. 1992. An *Arabidopsis* mutant defective in the general phenylpropanoid pathway. *Plant Cell*. 4:1413–1424.
- Chen, F., Srinivasa, R. M. S., Temple, S., Jackson, L., Shadle, G. and Dixon, R. A. 2006a. Multi-site genetic modulation of monolignol biosynthesis suggests new routes for formation of syringyl lignin and wall-bound ferulic acid in alfa alfa (*Medicago sativa* L.). *Plant Journal*. 48:113–124.
- Chen, M. J., Vijaykumar, V., Lu, B. W., Xia, B. and Li, N. 2005. *Cis*- and *Trans*-cinnamic acids have different effects on the catalytic properties of *Arabidopsis* phenylalanine ammonialyases PAL1, PAL2 and PAL4. *Journal of Integrative Plant Biology*. 47(1):67–75.

- Chen, S., Zhou, B., Lin, S., Li, X. and Ye, X. 2011. Accumulation of cinnamic acid and vanillin in eggplant root exudates and the relationship with continuous cropping obstacle. *African Journal of Biotechnology*. 10(14):2659–2665.
- Chen, Y., Zhang, X., Wu, W., Chen, Z., Gu, H. and Qu, L. J. 2006b. Overexpression of the wounding-responsive gene *AtMYB15* activates the shikimate pathway in *Arabidopsis*. *Journal of Integrative Plant Biology*. 48:1084–1095.
- Chirinos, R., Betalleluz-Pallardel, I., Huaman, A., Arbizu, C., Pedreschi, R. and Campos, D. 2009. HPLC-DAD characterization of phenolic compounds from *Oxalis tuberosa* tubers and their contribution to the antioxidant capacity. *Food Chem*. 113:1243–1251.
- Cho, M. H., Corea, O. R. A., Yang, H., Bedgar, D. L., Laskar, D. D., Anterola, A. M., Anterola, M. F. A., Hood, R. L., Kohalmi, S. E. and Bernards, M. A. 2007. Phenylalanine biosynthesis in *Arabidopsis thaliana*– identification and characterization of arogenate dehydratases. *Journal of Biological Chemistry*. 282:30827–30835.
- Chobot, V., Huber, C., Trettenhahn, G. and Hadacek, F. 2009. (±)-Catechin: chemical weapon, antioxidant, or stress regulator. *J. Chem. Ecol.* 35:980–996.
- Choi, O., Wu, C. Z., Kang, S. Y., Ahn, J. S., Uhm, T. B. and Hong Y. S. 2011. Biosynthesis of plant-specific phenylpropanoids by construction of an artificial biosynthetic pathway in *E. coli*. *J. Ind. Microbiol. Biotechnol.* 38(10):1657–65.
- Chon, S. U., Jang, H. G., Kim, D. K., Kim, Y. M., Boo, H. O. and Kim, Y. J. 2005. Allopathic potential in lettuce (*Lactuca sativa* L.) plants. *Sci. Hort.* 106:309–317.
- Chung, T. W., Moon, S. K., Chang, Y. C. and Ko, J. H. 2004. Novel and therapeutic effect of caffeic acid and caffeic acid phenyl ester on hepatocarcinoma cells: complete regression of hepatoma growth and metastasis by dual mechanism. *FASEB J.* 18:1670–1681.
- CNCIC. 2006. China National Chemical Information Center.
- Corea, O. R. A., Ki, C., Cardenas, C. L., Kim, S. J., Brewer, S. E., Patten, A. M., Davin, L. B. and Lewis, N. G. 2012. Arogenate dehydratase isoenzymes profoundly and differentially modulate carbon flux into lignins. *Journal of Biological Chemistry*. 287:11446–11459.
- Croteau, R., Kutchan, T. M. and Lewis, N. G. 2000. In: Buchanan, B., Grissem, W., Jones, R. (Eds), *Biochemistry & Molecular Biology of Plants*, American Society of Plant Physiologists, Rockville, M. O. 1250–1318.

- Daayf, F., Bel-Rhlid, R. and Belanger, R. R. 1997. Methyl ester of *p*-coumaric acid: A phytoalexin-like compound from long english cucumber leaves. *J. Chem. Ecol.* 23:1517–1526.
- Dabrowski, K. J. and Sosulski, F. W. 1984. Composition of free and hydrolysable phenolics acids In defatted flours of ten oilseeds. *Journal of Agricultural and Food Chemistry.* 32:128–130.
- Da-Cunha, F. M., Duma, D., Assreuy, J., Buzzi, F. C., Niero, R., Campos, M. M. and Calixto, J. B. 2004. Caffeic acid derivatives: *in vitro* and *in vivo* anti-inflammatory properties. *Free Radic. Res.* 38(11):1241–1253.
- Dao, L. and Friedman, M. 1994. Chlorophyll, chlorogenic acid, glycoalkaloid and protease inhibitor content of fresh and green potatoes. *J. Agric. Food Chem.* 42:633–639.
- Davin, L. B. and Lewis, N. G. 2000. Dirigent proteins and pirigent sites explain the mystery of specificity of radical precursor coupling in lignan and lignin biosynthesis. *Physiol.* 123:453.
- De Klerk, G., Guan, H., Huisman, P. and Marinova, S. 2011. Effects of phenolic compounds on adventitious root formation and oxidative decarboxylation of applied indole acetic acid in *Malus* ‘Jork 9’. *Plant Growth Regul.* 63:175–185.
- Dias, C., Dias, M., Borges, C., Almoester-Ferreira, M. A., Paulo, A. and Nascimento, J. 2003. Structural elucidation of natural 2-hydroxy di and tri carboxylic acids and esters, phenylpropanoid esters and a flavonoid from *Autonoe madeirensis* using gas chromatographic/electron ionization, electrospray ionization and tandem mass spectrometric techniques. *J. Mass Spectrom.* 38:1240–1244.
- Dickerson, D. P., Pascholati, S. F., Hagerman, A. E., Butler, L.G. and Nicholson, R. L. (1984). Phenylalanine ammonia-lyase and hydroxycinnamate: CoA ligase in maize mesocotyl inoculated with *Helmintho sporium maydis* or *Hemintho sporium carbonum*. *Physiol. Plant Pathol.* 25: 111-123.
- Dimberg, L. H., Theander, O. and Lingnert, H. 1993. Avenanthramides – a group of phenolic antioxidants in oats. *Cereal Chemistry.* 70:637–641.
- Ding, H., Sun, Y., Xiao, C. L., Shi, K., Zhou, Y. H. and Yu, J. Q. 2007. Physiological basis of different allelopathic reactions of cucumber and figleaf gourd plants to cinnamic acid. *Journal of Experimental Botany.* 58(13):3765–3773.
- Dixon, R. A. 2001. Natural products and plant disease resistance. *Nature.* 411:843–847.

- Dixon, R. A. and Lamb, C. J. 1990. Molecular communication in interactions between plants and microbial pathogens. *Annu. Rev. Plant Physiol.* 41:339–367.
- Dixon, R. A. and Steele, C. L. 1999. Flavonoid and isoflavonoids: a gold mine for metabolic engineering. *Trends Plant Sci.* 4:394–400.
- Dixon, R. A. and Sumner, L. W. 2003. Legume natural products: Understanding and manipulating complex pathways for human and animal health. *Plant Physiol.* 131:878–885.
- Dixon, R. A., Achnine, L., Kota, P., Liu, C. J., Reddy, M. S., Wang, L. 2002. The phenylpropanoid pathway and plant defense: A genomics perspective. *Mol. Plant Pathol.* 3:371–390.
- Dixon, R. A., Canovas, P., Guo, Z. J., He, X. Z. and Lamb, C. 1999. PAL and C4H colocalization of 3107 loop at the entry point into the phenylpropanoid pathway. *Plant Physiol.* 122:107–116.
- Dodson, C. H., Dressler, R. L., Hills, H. G., Adams, R. M. and Williams, N. H. 1969. Biologically active compounds in orchid fragrances. *Science.* 164:1243–1249.
- Doorselaere, V. J., Joseleau, J. P. and Vuylsteke, M. 2004. Molecular phenotyping of the *pal1* and *pal2* mutants of *Arabidopsis thaliana* reveals farreaching consequences on phenylpropanoid, amino acid and carbohydrate metabolism. *Plant Cell.* 16:2749–2771.
- Dos Santos, W. D., Ferrarese, M. L. L., Nakamura, C. V., Mourao, K. S. M., Mangolin, C. A. and Ferrarese-Filho, O. 2008. Soybean (*Glycine max*) root lignification induced by ferulic acid. The possible mode of action. *J. Chem. Ecol.* 34:1230–1241.
- Doyle, J. J. and Doyle, J. L. 1987. A rapid DNA isolation procedure for small quantities of fresh leaf tissue. *Phytochem. Bull.* 19:11-15
- Dursum, E., Otlis, S. and Akcicek, E. 2004. Herbs as food source in Turkey. *Assian Pacific J. Cancer Prev.* 5:334–339.
- Ebrahimzadeh, H. and Abrishamchi, P. 2001. Changes in IAA, phenolic compounds, peroxidase, IAA oxidase and polyphenol oxidase in relation to flower formation in *Crocus sativus*. *Russian Journal of Plant Physiology.* 48(2):190–195.
- El-Moursi, A., Talaat, I. M. and Balbaa, L. K. 2012. Physiological effect of some antioxidant polyphenols on sweet margoran (*Magorana hortensis*) plants. *Bioscience.* 4(1):1115.
- Eltz, T. and Lunau, K. 2005. Antennal response to fragrance compounds in male orchid bees. *Chemoecology.* 15:135–138.

- Firn, R. D. and Jones, C. G. 2009. A darwinian view of metabolism: Molecular properties determine fitness. *J. Exp. Bot.* 60:719–726.
- Floridi, S., Motanari, L., Marconi, O. and Fantozzi, P. 2003. Determination of free phenolic acids in wort and beer by colorimetric array detection. *J. Agric. Food Chem.* 51:1549–1554.
- Fraser, C. M., Thompson, M. G., Shirley, A. M., Ralph, J., Schoenherr, J. A., Sinlapadech, T., Hall, M. C. and Chapple, C. 2007. Related *Arabidopsis* serine carboxypeptidase-like sinapoylglucose acyltransferases display distinct but overlapping substrate specificities. *Plant Physiol.* 144:1986–1999.
- Friedman, M. 1997. Chemistry, biochemistry, and dietary role of potato polyphenols. *J. Agric. Food Chem.* 45:1523–1540.
- Fuzita, K. and Kubo, I. 2003. Synergism of polygodial and *trans*- cinnamic acid on inhibition of root elongation in lettuce seedling growth bioassays. *J. Chem. Ecol.* 29:2253–2262.
- Gang, D. R. 2005. Evolution of flavors and scents. *Annu. Rev. Plant Biol.* 56:301–325.
- Garcia, R., Erazo, S., Canepa, A., Lemus, I. and Erazo, S. 1990. Secondary metabolites of *Escalloni aillinita*. *An. Real Acad. Farm.* 56:539–542.
- Gaspar, T. M., Bouchet, A. A. and Khan-Frics, D. 1975. Cytokinin interaction with ABA and coumarin in relation to growth and isoperoxidases of Lentil. *Bull. Soc. R. Bot. Belg.* 108:5–16.
- Ghareib, H. R., Abdelhamed, M. S. and Ibrahim, O. H. 2010. Antioxidative effects of the acetone fraction and vanillic acid from *Chenopodium murale* on tomato plants. *Weed. Biol. Manage.* 10:64–72.
- Grabber, J. H., Ralph, J. and Hatfield, R. D. 2000. Cross-linking of maize walls by ferulate dimerization and incorporation into lignin. *Journal of Agricultural and Food Chemistry.* 48:6106–6113.
- Grabber, J. H., Ralph, J. and Hatfield, R. D. 2002. Model studies of ferulate-coniferyl alcohol crossproduct formation in primary maize walls: implications for lignification in grasses. *Journal of Agricultural and Food Chemistry.* 50:6008–6016.
- Graf, E. 1992. Antioxidant potential of ferulic acid. *Free Radic. Biol. Med.* 13:435–448.
- Grayer, R. J. and Harborne, J. B. 1994. A survey of antifungal compounds from higher plants 1982-1993. *Phytochemistry.* 37:19–42.

- Griffiths, D. W. and Bain, H. 1997. Photo induced changes in the concentration of individual chlorogenic acid isomers in potato (*Solanum tuberosum*) tubers and their complexation with ferric ions. *Potato Res.* 40:307–315.
- Guo, D., Wong, W. S., Xu, W. Z., Sun, F. F., Qing, D. J. and Li, N. 2011. *cis*- Cinnamic acid-enhanced 1 gene plays a role in regulation of *Arabidopsis* bolting. *Plant Mol. Biol.* 75(4-5):481–495.
- Guzman, J. D. 2014. Natural cinnamic acids, synthetic derivatives and hybrids with antimicrobial activity. *Molecules.* 19(12):19292–19349.
- Haagen-Smit, S. A. J. and Went, F. W. 1935. A physiological analysis of the growth substance. *Proceedings: Royal Academy of Sciences in Amsterdam.* 38:852–857.
- Hahlbrock, K. and Scheel, D. 1989. Physiology and molecular biology of phenylpropanoid metabolism. *Annu. Rev. Plant Physiol.* 40:347–369.
- Harborne, J. B. 1980. Secondary Plant Products. Bell, E.A. and Charlwood, B.W. (Eds), *Encyclopedia of Plant Physiology*, (8). Springer-Verlag, Berlin, 329.
- Hartmann, T. 1991. Alkaloids. In herbivores; their interaction with secondary plant metabolites, (I). *The chemical participants*, 2nd ed., G.A. Rosenthal and M. R. Berenbaum, Eds. Academic press, San Diego. 33-85.
- Hartmann, T. 2007. From waste products to ecochemicals: Fifty years research of plant secondary metabolism. *Phytochemistry.* 68:2831–2846.
- Haskins, F. A., Williams, L. G. and Gorz, H. J. 1964. Light-induced *trans* to *cis* conversion of D-glucosyl *o*-hydroxycinnamic acid in *Melilotus alba* leaves. *Plant Physiol.* 39:777–781.
- Hassan, S. M. and Ghareib, H. R. 2009. Bioactivity of *Ulva lactuca* L. acetone extract on germination and growth of lettuce and tomato plants. *Afr. J. Biotech.* 8:3832–3838.
- Hatfield, R. and Vermerris, W. 2001. Lignin formation in plants. The dilemma of linkage specificity. *Plant Physiol.* 126:1351.
- Hatfield, R. D., Ralph, J. and Grabber, J. H. 1999. Cell wall cross-linking by ferulates and diferulates in grasses. *Journal of the Science of Food and Agriculture.* 79:403–407.
- Hatfield, R., Ralph, J. and Grabber, J. H. 2008. A potential role for sinapyl *p*-coumarate as a radical transfer mechanism in grass lignin formation. *Planta.* 228:919–928.
- He, H. Q. and Lin, W. X. 2001. Studies on allelopathic physiobiochemical characteristics of rice. *Chin. J. Eco. Agric.* 9:56–57.

- Hedge, J. E. and Hofreiter, B. T. 1962. In: Carbohydrate chemistry 17. (Eds). Whistler, R. L. and Be-Miller, J. N. Academic Press, New York.
- Hegab, M. M. 2005. Assessment of the allelopathic effect of some phenolic compounds on some physiological processes of pea plant (*Pisum sativum*). Ph.D. Thesis, Faculty of science, Beni-sueif University, Egypt.
- Hegab, M. M., Khodary, S. E. A., Hammouda, O. and Ghareib, H. R. 2008. Autotoxicity of chard and its allelopathic potentiality on germination and some metabolic activities associated with growth of wheat seedlings. *Afr. J. Biotech.* 7:884–892.
- Hiradate, S., Morita, S., Furubayashi, A., Fujii, Y. and Harada, J. 2005. Plant growth inhibition by *cis*-cinnamoyl. *Ecology.* 31(3):591–601.
- Hiraga, Y., Chen, L., Kurokawa, M., Ohta, S., Suga, T. and Hirata, T. 1996. Structure-activity relationships of cinnamic acid derivatives as germination inhibitor of the fern *Gleichenia japonica*. *Nat. Prod. Lett.* 9:21–26.
- Hitchcock, A. E. 1935. Indole-3-n-propionic acid a growth hormone and quantitative measurement of plant response. *Contributions from Boyce Thompson Institute.* 7:87–85.
- Hooper, S. N., Jurgens, T., Chandler, R. F. and Stevens, M. F. G. 1984. Methyl *p*-coumarate: A cytotoxic constituent from *Comptonia peregrina*. *Phytochemistry.* 23:2096–2097.
- Horbowicz, M., Mioduszevska, H., Koczkodaj, D. and Saniewski, M. 2009. The effect of methyl jasmonate and phenolic acids on growth of seedlings and accumulation of anthocyanins in common buckwheat (*Fagopyrum esculentum*). *Acta. Agrobot.* 62: 49–56.
- Hrubcova, M., Cvikrova, M., Eder, J., Zon, J. and Machackova, I. 2000. Effect of inhibition of phenylpropanoid biosynthesis on peroxidase and IAA oxidase activities and auxin content in *alfa alfa* suspension cultures. *Plant Physiol. Biochem.* 38:949–956.
- Huang, X. and Bie, Z. 2010. Cinnamic acid-inhibited ribulose-1,5-bisphosphate carboxylase activity is mediated through decreased spermine and changes in the ratio of polyamines in cowpea. *J. Plant Physiol.* 167(1):47–53.
- Hussain, M. I., Gonzalez, L. and Reigosa, M. J. 2008. Germination and growth response of four plant species towards different allelochemicals and herbicides. *Allelopathy Journal.* 22:101–110.
- Iijima, Y., Davidovich-Rikanati, R., Fridman, E., Gang, D. R., Bar, E., Lewinsohn, E. and Pichersky, E. 2004a. The biochemical and molecular basis for the divergent patterns

- in the biosynthesis of terpenes and phenylpropenes in the peltate glands of three cultivars of basil. *Plant Physiol.* 136:3724–3736.
- Iijima, Y., Gang, D. R., Fridman, E., Lewinsohn, E. and Pichersky, E. 2004b. Characterization of geraniol synthase from the peltate glands of sweet basil. *Plant Physiol.* 134:370–379.
- Iiyama, K., Lam, T. B. T. and Stone, B. A. 1994. Review. Structural characteristics of cell walls of forage grasses—their nutritional evaluation for ruminants. *Plant Physiol.* 104:315.
- Jha, S. S. and Ohri, D. 2002. Comparative study of seed protein profiles in the genus *Pisum*. *Biologia Plantarum.* 45 (4): 529-532.
- Jitareanu, A., Irina, B. O. Z., Gabriela, T., Anamaria, Z. and Bancioc, U. S. 2013. The effects of some cinnamic acid derivatives on the architecture of *Phaseolus vulgaris* roots. *Romanian Biotechnological Letters.* 18:3.
- Jitareanu, A., Tataringa, G., Zbancioc, A. M. and Stanescu, U. 2011. Toxicity of some cinnamic acid derivatives to common bean (*Phaseolus vulgaris*). *Notulae Botanicae Horti. Agrobot.* 39(2):130–134.
- Jouanin, L. and Lapierre, C. 2008. Redirection of the phenylpropanoid pathway to feruloyl malate in *Arabidopsis* mutants deficient for cinnamoyl-CoA reductase 1. *Planta.* 227:943–956.
- Kanski, J., Aksenova, M., Stoyanova, A. and Butterfield, D. A. 2002. Ferulic acid antioxidant protection against hydroxyl and peroxy radical oxidation in synaptosomal and neuronal cell culture systems *in vitro*: structure-activity studies. *J. Nutr. Biochem.* 13:273–281.
- Kefeli, V. I. and Kadyrov, C. S. 1971. Natural growth inhibitors, their chemical and physiological properties. *Annual Review of Plant Physiology.* 22:185–196.
- Khan, M. I. R., Fatma, M., Naser, T. S., Anjum, A. and Khan, N. A. 2015. Salicylic acid induced abiotic stress tolerance and underlying mechanisms in plants. *Front. Plant Sci.* 6:462.
- Khoddami, A., Meredith, A., Wilkes, A. and Roberts, T. H. 2013. Techniques for analysis of plant phenolic compounds. *Molecules.* 18:2328–2375.
- Kikuzaki, H., Hisamoto, M., Hirose, K., Akiyama, K. and Taniguchi, H. 2002. Antioxidant properties of ferulic acid and its related compounds. *Agri. Food Chem.* 50:2161–2168.

- Kim, Y. H., Hamayun, M., Khan, A. L., Na, C. I., Kang, S. M., Han, H. H. and Lee, I. J. 2009. Exogenous application of plant growth regulators increased the total flavonoid content in *Taraxacum officinale* Wigg. *African Journal of Biotechnology*. 8(21):5727–5732.
- Korosec, B., Sova, M., Turk, S., Kravec, N., Novak, M., Lah, L., Stojan, J., Podobnik, B., Berne, S., Zupanec, N., Bunc, M., Gobec, S. and Komel, R. 2014. Antifungal activity of cinnamic acid derivatives involves inhibition of benzoate 4-hydroxylase (CYP53). *Journal of Applied Microbiology*. 116(4):955–966.
- Kovacik, J., Klejdus, B., Backor, M. and Repcak, M. 2007. Phenylalanine ammonia lyase activity and phenolic compounds accumulation in nitrogen-deficient *Matricaria chamomilla* leaf rosettes. *Plant Sci*. 172:393–399.
- Kozłowska, H., Naczek, M., Shahidi, F. and Zadernowski, R. 1990. Phenolic acids and tannins in rapeseed and canola. In: Canola and Rapeseed. production, chemistry, nutrition and processing technology. Shahidi F. (ed) United States of America, Van Nostrand Reinhold. 193–210.
- Laemmli, U. K. 1970.. Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature*. 227: 680-685.
- Laloraya, M. M. 1986. Reversal of ABA induced stomatal closure by *trans*- cinnamic and *p*-coumaric acid. *Plant Physiol*. 81:253–258.
- Landry, L. G., Chapple, C. C. S. and Last, R. L. 1995. *Arabidopsis* mutants lacking phenolic sunscreens exhibit enhanced ultraviolet-B injury and oxidative damage. *Plant Physiol*. 109:1159–1166.
- Lang, M., Strober, F. and Lichtenthaler, H. K. 1991. Fluorescence emission spectra of plant leaves and plant constituents. *Radiation and Environmental Biophysics*. 30:333–347.
- Lathia, D. and Frentzen, U. 1980. Synergistic effect of chlorogenic acid and thiocyanate on *in vitro* formation of N-methyl-N-nitrosoaniline under physiological conditions. *Food Chem. Toxicol*. 18:463–465.
- Leple, J. C., Dauwe, R., Morreel, K., Storme, V., Lapiere, C., Pollet, B., Naumann, A., Kang, K. Y., Kim, H. and Ruel, K. 2007. Downregulation of cinnamoyl-coenzyme A reductase in poplar: multiple level phenotyping reveals effects on cell wall polymer metabolism and structure. *Plant Cell*. 19:3669–3691.
- Leslie, C. A. and Romani R. J. 1998. Inhibition of ethylene biosynthesis by salicylic acid. *Plant Physiol*. 88: 833–837.

- Lewis, N. G. and Yamamoto, E. 1990. Lignin: occurrence, biogenesis and biodegradation. *Ann. Rev. Plant Physiol.* 41:455.
- Lim, E. K., Li, Y., Parr, A., Jackson, R., Ashford, D. A. and Bowles, D. J. 2001. Identification of glucosyltransferase genes involved in sinapate metabolism and lignin synthesis in *Arabidopsis*. *J. Biol. Chem.* 276: 4344–4349.
- Lima, R. B., Salvador, V. H., Santos, W. D. D., Bubna, G. A., Teixeira, A. F., Soares, A. R., Marchiosi, R., Ferrarese, M. L. L. and Filho, O. F. 2013. Enhanced lignin monomer production caused by cinnamic acid and its hydroxylated derivatives inhibits soybean root growth. *PLOS ONE*. 8(12):80542.
- Locher, R., Martin, V., Grison, R. and Pilet, P. E. 1994. Cell wall bound *trans*- and *cis*-ferulicacids in growing maize roots. *Plant Physiol.* 90:734–738.
- Lorenzen, M., Racicot, V., Strack, D. and Chapple, C. 1996. Sinapic acid ester metabolism in wild type and a sinapoylglucose-accumulating mutant of *Arabidopsis*. *Plant Physiol.* 112:1625–1630.
- Lowry, O. H., Rosenbrough, N. J., Farr, A. L. and Randall, R. J. 1951. Protein measurement with the Folin-phenol reagent. *Jour. Biol. Chem.* 193:265.
- Lu, Y. and Foo, Y. 1999. The polyphenol constituents of grape pomace. *Food Chem.* 65:1–8.
- Mahesh, V., Million-Rousseau, R., Ullmann, P., Chabrilange, N., Bustamante, J., Mondolot, L., Morant, M., Noirot, M., Hamon, S. and De Kochko, A. 2007. Functional characterization of two *p*-coumaroyl ester 3-hydroxylase genes from coffee tree: evidence of a candidate for chlorogenic acid biosynthesis. *Plant Molecular Biology.* 64:145–159.
- Malick, C. P. and Singh, M. B. 1980. In: *Plant Enzymology and Histoenzymology* Kalyani Publishers, New Delhi, 286p.
- Man, D., Bao, Y. X. and Han, L. B. 2011. Drought tolerance associated with proline and hormone metabolism in two tall fescue cultivars. *Hort. Science.* 46(7):1027–1032.
- Martin-Tanguy, J. 1997. Conjugated polyamines and reproductive development: biochemical, molecular and physiological approaches. *Physiologia Plantarum.* 100:675–688.
- Masoumian, M., Arbakariya, A., Syahida, A. and Maziah, M. 2011. Flavonoids production in *Hydrocotyle bonariensis* callus tissues. *Journal of Medicinal Plants Research.* 5(9):1564–1574.

- Mavandad, M., Edwards, R., Liang, X., Lamb, C. J. and Dixon, R. A. 1990. Effects of *trans*-cinnamic acid on expression of the bean Phenylalanine Ammonia Lyase gene family. *Plant Physiol.* 94:671–680.
- Mayer, A. M., Harel, E. and Shaul, R. B. 1965. Assay of catechol oxidase: a critical comparison of methods. *Phytochem.* 5: 783-789.
- Mazid, M., Khan, T. A. and Mohammad, F. 2011. Role of secondary metabolites in defense mechanisms of plants. *Biology and Medicine.* 3(2):232–249.
- Meeprom, A., Sompong, W., Suantawee, T., Thilavech, T., Chan, C. B. and Adisakwattana, S. 2015. Isoferulic acid prevents methylglyoxal-induced protein glycation and DNA damage by free radical scavenging activity. *BMC Complement Altern. Med.* 5: (1):346.
- Meyer, K., Cusumano, J. C., Somerville, C. and Chapple, C. C. S. 1996. Ferulate-5-hydroxylase from *Arabidopsis thaliana* defines a new family of cytochrome P450-dependent monooxygenases. *Proc. Natl. Acad. Sci. U. S. A.* 93:6869–6874.
- Milkowski, C. and Strack, D. 2010. Sinapate esters in brassicaceous plants: biochemistry, molecular biology, evolution and metabolic engineering. *Planta.* 232:19–35.
- Miller, H. G., Ikawa, M. and Peirce, L. C. 1991. Caffeic acid identified as an inhibitory compound in *Asparagus* root filtrate. *Hort. Science.* 26(12):1525–1527.
- Mir Derikvand, M., Berrio Sierra, J., Ruel, K., Pollet, B., Do, C. T., The´venin, J., Buffard, D., Jouanin, L. and Lapierre, C. 2008. Redirection of the phenylpropanoid pathway to feruloyl malate in *Arabidopsis* mutants deficient for cinnamoyl-CoA reductase. *Planta.* 227:943–956.
- Molina, I., Li-Beisson, Y., Beisson, F., Ohlrogge, J. B. and Pollard, M. 2009. Identification of an *Arabidopsis* feruloyl-coenzyme A transferase required for suberin synthesis. *Plant Physiology.* 151:1317–1328.
- Mukharjee, D. and Kumar, R. 2007. Kinetin regulates plant growth and biochemical changes during maturation and senescence of leaves, flowers, and pods of *Cajanus cajan* L. *Biol. Plant.* 50:80–85.
- Murphy, A., Peer, W. A. and Taiz, L. 2000. Regulation of auxin transport by aminopeptidases and endogenous flavonoids. *Planta.* 211:315–324.
- Narasimhan, B., Belsare, D. and Pharande, D. 2004. Esters, amides and substituted derivatives of cinnamic acid: synthesis, antimicrobial activity and QSAR investigations. *Eur. J. Med. Chem.* 39 (10):827–834.

- Natella, F., Nardini, M., Felice, D. M. and Scaccini, C. 1999. Benzoic and cinnamic acid derivatives as antioxidants: structure-activity relation. *J. Agric. Food Chem.* 47:1453–1459.
- Ncube, N. E, Mhlongo, M., Piater, L. A., Steenkamp, P. A., Dubery, I. A. and Madala, N. E. 2014. Analyses of chlorogenic acids and related cinnamic acid derivatives from *Nicotiana tabacum* tissues with the aid of UPLC-QTOF-MS/MS based on the in-source collision-induced dissociation method. *Chemistry Central Journal.* 8:66.
- Neto, A. C. R., Maraschin, M. and Piero, R. M. D. 2015. Antifungal activity of salicylic acid against *Penicillium expansum* and its possible mechanisms of action. *Int. J. Food Microbiol.* 28: 215:64–70.
- Niwa, T., Doi, U., Kato, Y. and Osawa, T. 1999. Inhibitory mechanism of sinapic acid against peroxynitrite-mediated tyrosine nitration of protein *in vitro*. *FEBS Letters.* 459(1):43–46.
- Nowacka, N., Nowak, R., Drozd, M., Olech, M., Los, R. and Malm, A. 2015. Antibacterial, antiradical potential and phenolic compounds of thirty-one polish mushrooms. *PLOS ONE* 10(10):e0140355.
- Nutbean, A. R. and Briggs, D. E. 1982. Gibberellin phenol interactions in plant extracts. *Phytochemistry.* 1: 2217–2224.
- Ober, D. and Hartmann, T. 1999. Homospermidine synthase, the first pathway-specific enzyme of pyrrolizidine alkaloid biosynthesis, evolved from deoxyhypusine synthase. *Proc. Natl. Acad. Sci. U.S.A.* 96:14777–14782.
- Odell, E., Raguso, R. A. and Jones, K. N. 1999. Bumblebee foraging responses to variation in floral scent and color in snapdragons (*Antirrhinum*: Scrophulariaceae). *Am. Midl. Nat.* 142:257–265.
- Ohashi, H., Yamamoto, E., Lewis, N. G. and Towers, G. H. N. 1987. 5- Hydroxyferulic acid in *Zea mays* and *Hordeum vulgare* cell walls. *Phytochemistry.* 26:1915–1916.
- Orcaray, L., Igal, M. and Zabalza, A. 2011. Role of exogenously supplied ferulic and *p*-coumaric acids in mimicking the mode of action of acetolactate synthase inhibiting herbicides. *Journal of agricultural and food chemistry.* 59(18):10162–10168.
- Palma, J. M., Sandalio, L. M., Corpas, F. J., Romero-Puertas, M. C., McCarthy, I. and Delrio, L. A. 2002. Plant proteases, protein degradation and oxidative stress: role of peroxisomes. *Plant Physiol.Biochem.* 40:521–530.

- Patel, D. and Thaker, V. 2007. Role of cell wall stiffening enzymes in internode development of *Merremia emarginata*. *Gen. Appl. Plant Physiology*. 33(1-2):25–39.
- Peer, W. A. and Murphy, A. S. 2007. Flavonoids and auxin transport: modulators or regulators? *Trends Plant Sci.* 12:556–563.
- Pina, A., Zhebentyayeva, T., Errea, P. and Abbott, A. 2012. Isolation and molecular characterization of cinnamate 4-hydroxylase from apricot and plum. *Biologia Plantarum*. 56(3):441–450.
- Politycka, B. and Mielcarz, B. 2007. Involvement of ethylene in growth inhibition of cucumber roots by ferulic and *p*-coumaric acids. *Allelopathy J.* 19:451–60.
- Prevost, M. S., Sandrine, D. C., Justine, M., Claire, C., Catherine, V. R., Arnaud, B., Therese, M., Pierre-Jean, C. and Delphine, J. 2013. Identification of cinnamic acid derivatives as novel antagonists of the prokaryotic proton-gated ion channel GLIC. *Med. Chem.* 56:4619–4630.
- Ralph, J. 2010. Hydroxycinnamates in lignification. *Phytochemistry Reviews*. 9:65–83.
- Ralph, J., Akiyama, T., Kim, H., Lu, F., Schatz, P. F., Marita, J. M., Ralph, S. A., Reddy, M. S. S., Chen, F. and Dixon, R. A. 2006. Effects of coumarate 3-hydroxylase down-regulation on lignin structure. *Journal of Biological Chemistry*. 281:8843–8853.
- Ralph, J., Bunzel, M., Marita, J. M., Hatfield, R. D., Lu, F., Kim, H., Schatz, P. F., Grabber, J. H. and Steinhart, H. 2004. Peroxidase-dependent cross-linking reactions of phydroxycinnamates in plant cell walls. *Phytochemistry Reviews*. 3:79–96.
- Ralph, J., Grabber, J. H. and Hatfield, R. D. 1995. Lignin-ferulate crosslinks in grasses: active incorporation of ferulate polysaccharide esters into ryegrass lignins. *Carbohydrate Research*. 275:167–178.
- Ralph, J., Hatfield, R. D., Quideau, S., Helm, R. F., Grabber, J. H. and Jung, H. J. G. 1994a. Pathway of *p*-coumaric acid incorporation into maize lignin as revealed by NMR. *Journal of the American Chemical Society*. 116:9448–9456.
- Ralph, J., Quideau, S., Grabber, J. H. and Hatfield, R. D. 1994b. Identification and synthesis of new ferulic acid dehydro-dimers present in grass cell walls. *Journal of the Chemical Society. Perkin Transactions*. 1:3485–3498.
- Rao, M. V., Paliyath, G., Ormrod, D. P., Murr, D. P. and Watkins, C. B. 1997. Influence of salicylic acid on H₂O₂ production, oxidative stress and H₂O₂ metabolizing enzymes. *Plant Physiol.* 115:137-149.

- Rasmussen, S. and Rudolph, H. 1997. Isolation, purification and characterization of UDP-glucose: *cis-p*-coumaric acid D-glucosyltransferase from *Sphagnum fallax*. *Phytochemistry*. 46:449–453.
- Rautengarten, C., Ebert, B., Ouellet, M., Nafisi, M., Baidoo, E. E. K., Benke, P., Stranne, M., Mukhopadhyay, A., Keasling, J. D. and Sakuragi, Y. 2012. *Arabidopsis* deficient in cutin ferulate encodes a transferase required for feruloylation of α -hydroxy fatty acids in cutin polyester. *Plant Physiology*. 158:654–665.
- Rawlinson, C., Kamphuis, L. G., Gummer, J. P. A., Singh, K. B. and Trengove, R. D. 2015. A rapid method for profiling of volatile and semi-volatile phytohormones using methyl chloroformate derivatisation and GC-MS. *Metabolomics*. 11(6):1922–1933.
- Ray, S. D., Guruprasad, K. N. and Laloraya, M. M. 1983. Reversal of ABA inhibited beta cyanin synthesis by phenolic compounds in *Amaranthus caudatus* seedlings. *Physiol. Plant*. 58:175–178.
- Reigosa, M. J. and Pazos-Malvido, E. 2007. Phytotoxic effects of 21 plant secondary metabolites on *Arabidopsis thaliana* germination and root growth. *Journal of Chemical Ecology*. 33:1456–1466.
- Rekoslavskaya, N. I., Gamburg, K. Z. and Gamanets, L. V. 1974. Effects of endogenous and exogenous polyphenols on metabolism and activity of IAA in a tobacco tissue suspension culture. *Fizol. Rast*. 21:721–727.
- Robbins, R.J. 2003. Phenolic acids in foods: An overview of analytical methodology. *J. Agric. Food Chem*. 51:2866–2887.
- Rohde, A., Morreel, K., Ralph, J., Goeminne, G., Hostyn, V., Rycke, D. R., Kushnir, S., Doorselaere V. J., Joseleau, J. P. and Vuylsteke, M. 2004. Molecular phenotyping of the *pal1* and *pal2* mutants of *Arabidopsis thaliana* reveals far reaching consequences on phenylpropanoid, amino acid and carbohydrate metabolism. *Plant Cell*. 16:2749–2771.
- Ruegger, M., Meyer, K., Cusumano, J. C. and Chapple, C. 1999. Regulation of ferulate-5-hydroxylase expression in *Arabidopsis* in the context of sinapate ester biosynthesis. *Plant Physiol*. 119:101–110.
- Saija, A., Tomaino, A., Trombetta, D., Pasquale, A., Uccella, N. and Barbuzzi, T. 2000. *In vitro* and *in vivo* evaluation of caffeic and ferulic acids as topical photoprotective agents. *Int. J. Pharm*. 199:39–47.

- Santos, W. D., Ferrarese, M. L. L., Finger, A., Teixeira, A. C. N. and Filho, F. O. 2004. Lignification and related enzymes in *Glycine max* root growth inhibition by ferulic acid. *Journal of Chemical Ecology*. 30:1199–1208.
- Schaefer, F. I. and Herrmann, K. 1982. Analysis of methyl and ethyl esters of hydroxybenzoic and hydroxycinnamic acids in plant material. *J. Chromatogr.* 240:387–396.
- Schiestl, F. P. and Roubik, D. W. 2003. Odor compound detection in male euglossine bees. *J. Chem. Ecol.* 29:253–257.
- Schmidt, A., Grimm, R., Schmidt, J., Scheel, D., Strack, D. and Rosahl, S. 1999. Cloning and expression of a potato cDNA encoding hydroxycinnamoyl-CoA: tyramine N-(hydroxycinnamoyl) transferase. *Journal of Biological Chemistry*. 274: 4273–4280.
- Schoch, G. A., Nikov, G. N., Alworth, W. L. and Werck-Reichhart, D. 2002. Chemical inactivation of the cinnamate 4-hydroxylase allows for the accumulation of salicylic acid in elicited cells. *Plant Physiol.* 130:1022–1031.
- Sederoff, R. R., Mackay, J. J., Ralph, J. and Hatfield, R. D. 1999. Unexpected variation in lignin. *Curr. Opin. Plant Biol.* 21–45.
- Seifert, K. and Unger, W. 1994. Insecticidal and fungicidal compounds from *Isatis tinctoria*. *Z. Naturforsch. C. J. Biosci.* 49:44–48.
- Sestili, P., Diamantini, G., Bedini, A. and Cerioni, L. 2002. Plant-derived phenolic compounds prevent the DNA single-strand breakage and cytotoxicity induced by tert-butyl-hydroperoxide via an iron-chelating mechanism. *Biochem. J.* 364:121–128.
- Sevgi, K., Tepe, B. and Sarikurkcü, C. 2015. Antioxidant and DNA damage protection potentials of selected phenolic acids. *Food Chem. Toxicol.* 24(77):12–21.
- Shadle, G., Chen, F., Reddy, S. M. S., Jackson, L., Nakashima, J. and Dixon, R. A. 2007. Down-regulation of hydroxycinnamoyl CoA: shikimate hydroxycinnamoyl transferase in transgenic *Alfa alfa* affects lignification, development and forage quality. *Phytochemistry*. 68:1521–1529.
- Shahidi, F. and Naczk, M. 2003. In: Phenolics in food and nutraceuticals: sources, applications and health effects. CRC Press, Boca Raton, FL.
- Sharma, P. 2011. Cinnamic acid derivatives: A new chapter of various pharmacological activities. *J. Chem. Pharm. Res.* 3(2):403–423.
- Sharma, Y. K and Kaushik, M. P. 1982. Endogenous level of auxin and IAA- oxidase activity as affected by some phenolic acids in cucumber (*Cucumis sativus*). *Acta. Bot. India.* 11:32–35.

- Sharma, V. and Strack, D. 1985. Vacuolar localization of I-sinapoyl glucose: L-malate sinapoyltransferase in protoplasts from cotyledons of *Raphanus sativus*. *Planta*. 163:563–568.
- Sheeja, T. E and Mandal, A. B. 2003. *In vitro* flowering and fruiting in tomato (*Lycopersicon esculentum* Mill.). *Asian Pacific Journal of Molecular Biology and Biotechnology*. 11(1):37–42.
- Shuab, R., Lone, R. and Koul, K. K. 2013. Cinnamate-kinetin interaction- effects on metabolite mobilization in isolated cucumber cotyledons. *Am-Euras. J. Agric. and Environ. Sci.* 13(11):1516–1525.
- Siemens, D. H., Garner, S. H., Mitchell-Olds, T., Callaway, R. M. 2002. Cost of defense in the context of plant competition: *Brassica rapa* may grow and defend. *Ecology*. 83(2):505–517.
- Sim, G. Y., Yang, S. M., Kim, B. G. and Ahn, J. H. 2015. Bacterial synthesis of N-hydroxycinnamoyl phenethylamines and tyramines. *Microb. Cell Fact.* 13: 14(1) 162.
- Singh, H. P., Kaur, S., Batish, D. R. and Kohli, K. R. 2009. Caffeic acid inhibits *in vitro* rooting in mung bean (*Vigna radiata* L.) hypocotyls by inducing oxidative stress. *Plant Growth Regul.* 57:21–30.
- Singh, P. K. and Kumar, C. V. 2014. Impact of cinnamic acid on physiological and anatomical changes in maize plants (*Zea mays* L.) grown under salinity stress. *Journal of Stress Physiology and Biochemistry*. 10(2):44–54.
- Singh, P. K., Koul, K. K., Tiwari, S. B. and Koul, R. K. 1997. Effect of cinnamate on nitrate reductase activity in isolated cucumber cotyledons. *Plant Growth Regulation*. 21(3):203–206.
- Singh, P. K., Singh, R. and Singh, S. 2013. Cinnamic acid induced changes in reactive oxygen species scavenging enzymes and protein profile in maize (*Zea mays* L.) plants grown under salt stress. *Physiol. Mol. Biol. Plant.* 19(1):53–59.
- Sinlapadech, T., Stout, J., Ruegger, M. O., Deak, M. and Chappie, C. 2007. The hyper-fluorescent trichome phenotype of the *brt1* mutant of *Arabidopsis* is the result of a defect in a sinapic acid:UDPG glucosyltransferase. *Plant J.* 49:655–668.
- Siqueira, J. O., Nair, M. G., Hammerschmidt, R. and Safir, G. R. 1991. Significance of phenolic compounds in plant–soil–microbial systems. *Crit. Rev. Plant Sci.* 10:63–121.

- Soler, M., Serra, O., Molinas, M., Huguët, G., Fluch, S. and Figueras, M. 2007. A genomic approach to suberin biosynthesis and cork differentiation. *Plant Physiology*. 144:419–431.
- Somogyi, M. 1952. Notes on sugar determination. *Journal of biological chemistry*. 195:19–23.
- Sood, V. and Nanda, K. K. 2006. Effect of gibberellic acid and monophenols on flowering of *Impatiens balsamina* in relation to the number of inductive and non-inductive photoperiodic cycles. *Physiological Plantarum*. 45(2):250–254.
- Spanos, G. A., Wrolstad, R. E. and Heatherbvell, D. A. 1990. Influence of processing and storage on the phenolic composition of apple juice. *J. Agric. Food Chem.* 38:1572–1579.
- Sri, B. M., Rukkumani, R. and Menon, V. P. 2003. Protective effects of ferulic acid on hyperlipidemic diabetic rats. *Acta Diabetol.* 40:118–122.
- Steffens, J. C. 2000. Acyltransferases in protease's clothing. *Plant Cell*. 12:1253–1255.
- Stevanovic, T., Diouf, P. N. and Garcia-Perez, M. E. 2009. Bioactive polyphenols from healthy diets and forest biomass. *Current Nutrition and Food Science*. 5(4):264–295.
- Steyn, W. J., Wand, S. J. E., Holcroft, D. M. and Jacobs, G. 2002. Anthocyanins in vegetative tissues: a proposed unified function in photoprotection. *New Phytol.* 155:349–361.
- Stoddart, J. L. 1986. Gibberellin receptors. In: Chadwick, C. M., Garrod, D. R. Ed. *Hormones, Receptors and Cellular Interactions in Plants*. New York: Cambridge University, 91–114.
- Stotz, H. U., Kroymann, J. and Mitchell-Olds, P. T. 1999. Plant insect interactions. *Current Opinion in Plant Biology*. 2:268–272.
- Szabados, L. and Savoure, A. 2010. Proline: a multifunctional amino acid L. *Trends in Plant Science*. 15(2):89–97.
- Tah, A. V. and Gosset G. 2015. Production of cinnamic and *p*-hydroxycinnamic acids in engineered microbes. *Front BioengBiotechnol.* 20(3):116.
- Taiz, L. and Zeiger, E. 2006. Secondary metabolites and plants defence. *Plant Physiol.* 4:316–344.
- Talaat, M. I. 2005. Physiological effect of salicylic acid and tryptophan on *Pelargonium graveolens*. *Egypt. J. Appl. Sci.* 20:751–760.

- Talaat, M. I. and Balbaa, K. L. 2010. Physiological response of sweet basil plants (*Ocimum basilicum* L.) to putrescine and *trans*-cinnamic acid. Botany Department, National Research Centre, Dokki, Giza, Egypt.
- Tayal, M. S. and Sharma, S. M. 1983. Interaction of phenols and IAA on germination and early seedling growth of *Cicer arietinum*. *Indian J. Plant Physiol.* 26:296–300.
- Thiyama, T., Stockmann, H., Felde, T. Z. and Schwarz, K. 2006. Antioxidative effect of the main sinapic acid derivatives from rapeseed and mustard oil by-products. *Eur. J. Lipid Sci. Technol.* 108:239–248.
- Tizio, R. M. 1976. Interaction of *p*-coumaric and ferulic acids with different gibberellins (G₁, G₃, G₅, G₇, G₉, and G₁₃) on tuberization of fragments of shoots of potato tubers grown *in vitro*. *Phyton. Rev. Int. Bot. Exp.* 34:117–120.
- Turner, L. B., Muller-Harvey, I. and Mc-Allan, A.B. 1993. Light-induced isomerization and dimerization of cinnamic acid derivatives in cell walls. *Phytochemistry.* 33(4):791–796.
- Tzin, V. and Galili, G. 2010. New insights into the shikimate and aromatic amino acids biosynthesis pathways in plants. *Molecular Plant.* 3:956–972.
- Vanholme, R., Demedts, B., Morreel, K., Ralph, J. and Boerjan, W. 2010. Lignin biosynthesis and structure. *Plant Physiology.* 153:895–905.
- Vanholme, R., Morreel, K., Darrah, C., Oyarce, P., John, H., Grabber, J. H., Ralph, J. and Boerjan, W. 2012a. Metabolic engineering of novel lignin in biomass crops. *New Phytologist.* 196(4):978–1000.
- Vanholme, R., Storme, V., Vanholme, B., Sundin, S., Christensen, J. H., Goemine, G., Halpin, C., Rohde, A., Morreel, K. and Boerjan, W. 2012b. A systems biology view of - responses to lignin biosynthesis perturbations in *Arabidopsis*. *Plant Cell.* 1(12):1025–1074.
- vanOverbeek, J., Brondeau, R. and Horne, V. 1951. *trans*-Cinnamic acid as an anti-auxin. *Am. J. Bot.* 38:589–595.
- Vaughan, D. and Ord, B. 1990. Influence of phenolic acids on morphological changes in roots of *Pisum sativum*. *J. Sci. Food Agric.* 52:289–99.
- Veldstra, H. 1953. The relation of chemical structure to biological activity in growth substances. *Annu. Rev. Plant. Physiol.* 4:151–198.

- Voigt, K. and Rademacher, E. 2015. Effect of the propolis components, cinnamic acid and pinocembrin, on *Apis mellifera* and *Ascosphaera apis*. *Journal of Apicultural Science*. 59(1):89–95.
- Wang, R. L., Staehelin, C., Xia, Q. Q., Su, Y. J. and Zeng, R. S. 2015. Identification and characterization of CYP9A40 from the tobacco cutworm moth (*Spodoptera litura*), a cytochrome P450 gene induced by plant allelochemicals and insecticides. *Int. J. Mol. Sci.* 16(9):22606–22620.
- Wang, Y. H. and Irving, H. R. 2011. Developing a model of plant hormone interactions. *Plant Signaling and Behavior*. 6(4):494–500.
- Wasano, N., Sugano, M., Nishikawa, K., Okuda, K., Shindo, M., Abe, H., Park, S.Y., Hiradatel, S., Kamo, T. and Fujii, Y. 2013. Root - specific induction of early auxin-responsive genes in *Arabidopsis thaliana* by *cis*-cinnamic acid. *Plant Biotechnology*. 30:465–471.
- Weir, T. L., Park, S. W. and Vivanco, J. M. 2004. Biochemical and physiological mechanisms mediated by allelochemicals. *Curr. Opin. Plant Biol.* 7:472.
- Whiting, D. A. 2001. Natural phenolic compounds 1900–2000: A bird's eye view of a centuries chemistry. *Nat. Prod. Rep.* 18:583–606.
- Williams, N. H. and Whitten, W. M. 1983. Orchid floral fragrances and male euglossine bees: Methods and advances in the last sesquidecade. *Biol. Bull.* 164:355–395.
- Wink, M. 1988. Plant breeding: importance of plant secondary metabolites for protection against pathogens and herbivores. *Theor. Appl. Genet.* 75:225–233.
- Winkel, B. S. J. 2004. Metabolic channeling in plants. *Annu. Rev. Plant Biol.* 55:85–107.
- Winkel-Shirley, B. 2002. Biosynthesis of flavonoids and effects of stress. *Curr. Opin. Plant Biol.* 5: 218–223.
- Witham, F. H., Blaydes, D. F. and Devlin, R. M. 1971. Experiments in plant physiology. van-Nostrand, New York, 245p.
- Wolszleger, M., Stan, C. D., Apotrosoaei, M., Vasincu, I. and Panzariu, L. P. 2014. New hydrazones of ferulic acid: synthesis, characterization and biological activity. *Rev. Med. Chir. Soc. Med. Nat. Iasi.* 118(4):1150–6.
- Wong, W. S., Guo, D., Wang, X. L., Yin, Z. Q., Xia, B. and Li, N. 2005. Study of *cis*-cinnamic acid in *Arabidopsis thaliana*. *Plant Physiol. Biochem.* 43:929–937.

- Wu, H., Haig, T., Pratley, J., Lemerle, D. 2001. Allelochemicals in wheat (*Triticum aestivum* L.): variation of phenolic acids in shoot tissues. *J. Chem. Ecol.* 27:25–135.
- Wu, T. S., Leu, Y. L. and Chan, Y. Y. 1999. Constituents of the fresh leaves of *Aristolochia cucurbitifolia*. *Chem. Pharm. Bull.* (Tokyo) 47:571–573.
- Yamada, T., Matsuda, F., Kasai, K., Fukuoka, S., Kitamura, K., Tozawa, Y., Miyagawa, H. and Wakasa, K. 2008. Mutation of a rice gene encoding a phenylalanine biosynthetic enzyme results in accumulation of phenylalanine and tryptophan. *Plant Cell.* 20:1316–1329.
- Yamamura, Y., Ogihara, Y. and Mizukami, H. 2001. Cinnamic acid 4-hydroxylase from *Lithospermum erythrorhizon*: cDNA cloning and gene expression. *Plant Cell Rep.* 20:655–662.
- Yamauchi, K. and Fukushima, K. 2004. The regulation from guaiacyl to syringyl lignin in the differentiating xylem of *Robiniap pseudoacacia*. *C. R. Biol.* 327:791–797.
- Yang, G. Q., Wan, F. H., Liu, W. X. and Zeng, X. W. 2006. Physiological effects of allelochemicals from leachates of *Ageratina adenophora* (Spreng.) on rice seedling. *Allelopathy J.* 18(2):237–246.
- Yang, X. X., Choi, H. W., Yang, S. F. and Li, N. 1999. A UV-light activated cinnamic acid isomer regulates plant growth and gravitropism via an ethylene receptor-independent pathway. *Aust. J. Plant Physiol.* 26:325–335.
- Yaryura, P. M., Cordo, G., Leo, M., Kerber, N., Pucheu, N., Gabriela, L., Rubio, G., Vivanco, J. and Garcial, A. 2013. Assessment of the role of fluorescent root and seed exudates in crop plants. *Journal of Plant Nutrition.* 36:811–824.
- Yoon, B. H., Jung, J. W., Lee, J. J., Cho, Y. W., Jang, C. G., Jin, C., Oh, T. H. and Ryu, J. H. 2007. Anxiolytic-like effects of sinapic acid in mice. *Life Sciences.* 81:234–240.
- Yu, J., Sun, Y., Zhang, Y., Ding, Y., Xia, X., Xiao, C., Shi, K. and Zhou, Y. 2009. Selective *trans*-cinnamic acid uptake impairs [Ca²⁺]_{cyt} homeostasis and growth in *Cucumis sativus*. L. *J. Chem. Ecol.* 35:1471–1477.
- Yun, K. J., Koh, D. J., Kim, S. H., Park, S. J., Ryu, J. H., Kim, D. G., Lee, J. Y. and Lee, K. T. 2008. Antiinflammatory effects of sinapic acid through the suppression of inducible nitric oxide synthase, cyclooxygenase 2, and proinflammatory cytokine expressions via nuclear factor- κ B inactivation. *Journal of Agriculture and Food Chemistry.* 56: 10265–10272.

- Zanardo, D. I. L., Lima, R. B., Ferrarese, M. L. L., Bubna, G. A. and Filho, F. O. 2009. Soyabean root growth inhibition and lignification induced by *p*-coumaric acid. *Environ. Exp. Bot.* 66:25–30.
- Zeng, R. S., Luo, S. M. and Shi, Y. H. 2001. Physiological and biochemical mechanism of allelopathy of secalonic acid on higher plants. *Agron. J.* 93:72–79.
- Zhang, L., Ravipati, A. S., Koyyalamudi, S. R., Jeong, S., Reddy, N., Smith, P. T., Bartlett, J., Shanmugam, K., Münch, G. and Wu, M. J. 2011. Antioxidant and anti-inflammatory activities of selected medicinal plants containing phenolic and flavonoid compounds. *J. Agric. Food Chem.* 59:12361–12367.
- Zhiqui, Y. Q., Wong, W. S., Ye, W. C. and Li, N. 2003. Biologically active *cis*- cinnamic acid occurs naturally in *Brassica parachinensis*. *Chin. Sci. Bull.* 48:555–558.
- Zou, Y., Kim, A. R., Kim, J. U., Choi, J. S. and Chung, H. Y. 2002. Peroxynitrite scavenging activity of sinapic acid (3,5-dimethoxy-4-hydroxycinnamic acid) isolated from *Brassica juncea*. *J. Agric. Food Chem.* 50(21):5884–5890.
