

## 5. REFERENCES

Adyt, T.P., Weller C.L., Testin R.F., 1991. Mechanical and barrier properties of edible corn and wheat protein films. *Journal of the American Society of Agricultural Engineers* 34, 207-211.

Ali, Y., Ghorpade, V.M., Hanna, M.A., 1997. Properties of thermally treated wheat gluten films. *Industrial Crops and Products* 6, 177-184.

Andres, C., 1984. Natural edible coating has excellent moisture and grease barrier properties. *Food Processing* 45, 48-49.

Anker M., Stading, M., Hermansson, A.M., 1998. Mechanical properties, water vapour permeability, and moisture contents of  $\beta$ -lactoglobulin and whey protein films using multivariate analysis. *Journal of Agricultural and Food Chemistry* 46, 1820-1829.

American Society of Brewing Chemists, 1976. Haze determination, Beer-26. American Society of Brewing Chemists, St. Paul, MN.

American Society for Testing and Materials, 1988. Standard method for tensile properties of thin plastic sheeting, designation D 882-97, Annual Book of the American Society for Testing and Materials, West Conshohocken, PA.

American Society for Testing and Materials, 1990. Standard test method for oxygen transmission rate through dry packaging using coulometric sensor, designation F 1307-90, Annual Book of the American Society for Testing and Materials, West Conshohocken, PA.

American Society for Testing and Materials, 1995. Standard methods for water vapour transmission of material, designation E 96-95, Annual Book of the American Society for Testing and Materials, West Conshohocken, PA.

- Anonymous, 2002a. Climate Change.  
[http://www.greenpeace.org/campaign/intro?campaign\\_id+3937](http://www.greenpeace.org/campaign/intro?campaign_id+3937), accessed 24<sup>th</sup> January 2004
- Anonymous, 2002b. Swiss-Prot, BSA. <http://www.expasy.org/cgi-bin/niceprot.pl?P02769>, accessed 24<sup>th</sup> January 2002.
- Anonymous, 2002c. Amino acid sequence of gamma kafirin.  
<http://www.expasy.ch/cgi-bin/niceprot.pl/printable?ac=Q41506>, accessed 24<sup>th</sup> January 2002.
- Argos, P., Pederson, K., Marks M.D., Larkins, B.A., 1982. A structural model for maize zein proteins. *Journal of Biological Chemistry* 257, 9984-9990.
- Arvanitoyannis, I.S., Nakayama, A., Aiba, S., 1998. Chitosan and gelatin based edible films: state diagrams, mechanical and permeation properties. *Carbohydrate Polymers* 37, 371-382.
- Asano, K., Shinagawa, K., Hashimoto, N., 1982. Characterization of haze forming proteins of beer and their roles in chill haze formation. *Journal of the American Society of Brewing Chemists* 40, 147-154.
- Baldwin, E.A., Nisperos-Carriedo, M.O., Baker, R.A., 1995. Use of edible coating to preserve quality of lightly (and slightly) processed products. *Critical Reviews in Food Science and Nutrition* 35, 509-524.
- Baldwin, E.A., Baker, R.A., 2002. Use of proteins in edible coatings for whole and minimally processed fruits and vegetables, in: Gennadios, A. (Ed.), Protein based films and coatings, CRC Press, Washington, DC, pp. 510-526.
- Bandekar, J., 1992. Amide modes and protein conformation. *Biochimica et Biophysica Acta* 1120, 123-143.

Bamforth, C.W., 1999. Beer haze. *Journal of the American Society of Brewing Chemists* 57, 81-90.

Baxter, N.J., Lilley, T.H., Haslam, E., Williamson, M.P., 1997. Multiple interactions between polyphenols and a salivary proline rich proteins repeat result in complexation and precipitation. *Biochemistry* 36, 5566-5577.

Belton, P.S., Delgadillo, I., Grant, A., Taylor, J.R.N., 1997. NMR and FTIR studies of cereal proteins, in: Carmona, P., Navarro, R. and Hernanz, A. (Eds.), *Spectroscopy of Biological Molecules, Modern Trends*, Kluwer Academic Publishers, Dordrecht, pp. 499-500.

Biddle, G., 1986. Films, plastic, in: Bakker M. (Ed.), *The Wiley Encyclopedia of Packaging Technology*, John Wiley and Sons, New York, pp. 331-335.

Bigi, A., Cojazzi, G., Panzavolta, S., Roveri, N., Rubini, K., 2002. Stabilization of gelatin films by crosslinking with genipin. *Biomaterials* 23, 4827-4832.

Bigi, A., Cojazzi, G., Panzavolta, S., Rubini, K., Roveri, N., 2001. Mechanical and thermal properties of gelatin films at different degrees of glutaraldehyde crosslinking. *Biomaterials* 22, 763-768.

Bozzola, J.J., Russell, L.D., 1992. *Electron Microscopy-Principles and Techniques for Biologists*, Jones and Bartlett Publishers, New York.

Brandenburg, A.H., Weller, C.L., Testin, R.F., 1993. Edible films and coatings from soy protein. *Journal of Food Science* 58, 1086-1089.

Bravo, L., 1998. Polyphenols: Chemistry, dietary sources, metabolism, and nutritional significance. *Nutrition Reviews* 56, 317-333.

Buffo, R.A., Weller, C.L., Gennadios, A., 1997. Films from laboratory-extracted sorghum kafirin. *Cereal Chemistry* 74, 473-475.

Butler, L.G., Riedl, D.J., Lebryk, D.G., Blytt, H.J., 1984. Interaction of proteins with sorghum tannin: Mechanism, specificity and significance. *Journal of the American Oil Chemists Society* 61, 916-920.

Byler, D.M., Susi, H., 1986. Examination of the secondary structure of proteins by deconvolved FTIR spectra. *Biopolymers* 25, 469-487.

Carter, R., Reck, D.R., 1970. Low temperature solvent extraction process for producing high purity zein. United States Patent & Trademark Office 3535305.

Chang, Y.P., Cheah, P.B., Seow, C.C., 2000. Plasticizing-antiplasticizing effects of tapioca starch films in the glassy state. *Journal of Food Science* 65, 445-451.

Charlton, A.J., Baxter, N.J., Khan, M.L., Moir, A.J.G., Haslam, E., Davies, A.P., Williamson, M.P., 2002. Polyphenol/peptide binding and precipitation. *Journal of Agricultural and Food Chemistry* 50, 1593-1601.

Chen, L.J., Hrazdina, G. 1981. Structural aspects of anthocyanin-flavonoid complex formation and its role in plant color. *Phytochemistry* 20, 297-301.

Cherian, G., Chinachoti, P., 1996.  $^2\text{H}$  and  $^{17}\text{O}$  nuclear magnetic resonance study of water in gluten in glassy and rubbery state. *Cereal Chemistry* 73, 618-625.

Cherian, G., Gennadios, A., Weller, C., Chinachoti, P., 1995. Thermo-mechanical behaviour of wheat gluten films: effect of sucrose, glycerin and sorbitol. *Cereal Chemistry* 72, 1-6.

Chick, J., Hernandez, R.J., 2002. Physical, thermal and barrier characterization of casein/wax based films. *Journal of Food Science* 67, 1073-1079.

Cho, S.Y., Park, J.W., Rhee, C., 2002. Properties of laminated films from whey powder and sodium caseinate mixtures and zein layers. *Lebensmittel-Wissenschaft und Technologie* 35, 135-139.

Coleman, C.E., Dannehoffer, J.M., Larkins, B.A., 1990. The prolamin proteins of maize, sorghum and coix, in: Larkins, B.A., Vasil, I.K. (Eds.), *Cellular and Molecular Biology of Plant Seed Development*, Kluwer Academic, Dordrecht, pp. 257-288.

Coultate, T.P., 1996. *Food: The Chemistry of Its Components*, third ed., The Royal Society of Chemistry, Cambridge, UK.

Cunningham, P., Ogale, A.A., Dawson P.L., Acton, J.C., 2000. Tensile properties of soy protein isolate films produced by a thermal compaction technique. *Journal of Food Science* 65, 668-671.

Cuq, B., Gontard, N., Guilbert, S., 1998. Proteins as agricultural polymers for food packaging production. *Cereal Chemistry* 75, 1-9

Cuq, B., Boutrot, F., Redl, A., Lullien-Pellerin, V., 2000. Study of the temperature effect on the formation of wheat gluten network: Influence on mechanical properties and protein solubility. *Journal of Agricultural and Food Chemistry* 48, 2954-2959.

Daiber, K.H., Taylor, J.R.N., 1982. Effect of formaldehyde on protein extraction and quality of high- and low-tannin sorghum. *Journal of Agricultural and Food Chemistry* 30, 70-72.

Damodaran, S., 1996. Amino acids, peptides, and proteins, in: Fennema, O.R., (Ed.), *Food Chemistry*, third ed. Marcel Dekker, New York, pp. 321-429.

Darby, N.J., Creighton, T.E., 1993. *Protein Structure*, first ed., Oxford University Press, Oxford. UK.

De Graaf, L.A., 2000. Denaturation of proteins from a non-food perspective. *Journal of Biotechnology* 79, 299-306.

Debeaufort, F., Quezada-Gallo J.A., Voilley, A., 1998. Edible films and coatings, tomorrow's packagings: A review. *Critical Reviews in Food Science and Nutrition*, 38: 299-313.

Debeaufort, F., Voilley, A., Meares, P., 1994. Water vapor permeability and diffusivity through methylcellulose edible films. *Journal of Membrane Science* 91, 125-133.

DeRose, R.T., Ma, D.P., Kwon, I.S., Hasnain, S.E., Klassy, R.C., Hall, T.C., 1989. Characterization of the kafirin gene family from sorghum reveals extensive homology with zein from maize. *Plant Molecular Biology* 12, 245-256.

Donhowe, I.G., Fennema, O.R., 1993. The effects of solution composition and drying temperature on crystallinity, permeability and mechanical properties of methyl cellulose films. *Journal of Food Processing and Preservation* 17, 231-246.

Druchta, J.M., Johnston, C.D., 2002. <http://www.csaceliacs.org/ediblefilms.htm>, accessed 22<sup>nd</sup> February 2002.

Duodu, K.G., Taylor, J.R.N., Belton, P.S., Hamaker, B.R., 2003. Mini review: Factors affecting sorghum protein digestibility. *Journal of Cereal Science* 38, 117-131.

Duodu, K.G., Tang, H., Grant, A., Wellner, N., Belton, P.S., Taylor J.R.N., 2001. FT-IR and solid state <sup>13</sup>C NMR spectroscopy of proteins of wet cooked and popped sorghum and maize. *Journal of Cereal Science* 33, 261-269.

Duodu, K.G., Nunes, A., Delgadillo, I., Parker, M.L., Mills, E.N.C., Belton, P.S., Taylor J.R.N., 2002. Effect of grain structure and cooking on sorghum and maize *in vitro* protein digestibility. *Journal of Cereal Science* 35, 161-174.

El Nour, I.N.A., Peruffo, A.D., Curioni, A., 1998. Characterization of sorghum kafirins in relation to their cross-linking behaviour. *Journal of Cereal Science* 28, 197-207.

Enviropak, 2002. Enviropak improving Southern Africa's export of fruits.  
<http://lvs.sik.se/enviropak/index/index.html>, accessed 15<sup>th</sup> July 2002

Faergemand, M., Murray, B.S., Dickinson, E., Qvist, K.B., 1999. Cross-linking of adsorbed casein films with transglutaminase. *International Dairy Journal* 9, 343-346.

Fang, Y., Tung, M.A., Britt, I.J., Yada, S., Dalgleish, D.G., 2002. Tensile and barrier properties of edible films made from whey proteins. *Journal of Food Science* 67, 188-193.

Foster, R., 1986. Ethylene-vinyl alcohol copolymers (EVOH), in: Bakker, M. (Ed.), *The Wiley Encyclopedia of Packaging Technology*, John Wiley and Sons, New York, pp. 270-275.

Freitas, V., Mateus, N., 2001. Structural features of procyanidin interactions with salivary proteins. *Journal of Agricultural and Food Chemistry* 49, 940-945.

Gearing J., 1999. Dynamic mechanical (thermal) analysis, in: Brown, R. (Ed.), *Handbook of Polymer Testing*, Marcel Dekker, New York, pp. 501-531.

Gennadios, A., Weller, C.L., 1990. Edible films and coatings from wheat and corn proteins. *Food Technology* 44 (10), 63-69.

Gennadios, A., Weller, C.L., Testin, R.F., 1993. Temperature effect on oxygen permeability of edible protein based films. *Journal of Food Science* 98, 212-214.

Gennadios, A., Weller, C.L., Gooding, C.H., 1994b. Measurement errors in water vapor permeability of highly permeable, hydrophilic films. *Journal of Food Engineering* 21, 395-409.

Gennadios, A., McHugh, T.H., Weller, C.L., Krochta, J., 1994a. Edible coatings and films based on proteins, in: Krochta, J.M., Baldwin, E.A., Nisperos-Carriedo, (Eds.), *Edible Coatings and Films to Improve Food Quality*, Technomic Publishing Company, Lancaster, PA, pp. 210-277.

Gennadios, A., Rhim, J.W., Handa, A., Weller, C.L., Hanna, M.A., 1998. Ultraviolet radiation affects the physical and molecular properties of soy protein films. *Journal of Food Science* 63, 225-228.

Glennie, C.W., 1984. Endosperm cell wall modification in sorghum grain during germination. *Cereal Chemistry* 61, 255-259.

Gontard, N., Guilbert, S., Cuq, J.L., 1992. Edible wheat gluten films: Influence of main process variables on film properties using response surface methodology. *Journal of Food Science* 57, 190-195, 199.

Gontard, N., Guilbert, S., and Cuq, J.L., 1993. Water and glycerol as plasticizers affect the mechanical and water vapour barrier properties of edible wheat gluten film. *Journal of Food Science* 58, 206-211.

Gupta, R.K., 2000. Dynamic mechanical properties, in: Gupta, R.K. (Ed.) *Polymer and Composite Rheology*, second ed. Marcel Dekker, New York, pp. 117-139.

Gupta, R.K., Haslam, E., 1978. Plant proanthocyanidins, part 5, polyphenols. *Journal of the Chemical Society Perkin Transactions I* 5, 982-896.

Hagenmaier, R.D., Shaw, P.E., 1992. Gas permeability of fruit coating waxes. *Journal of the American Society of Horticultural Science* 117, 105-109.

Hagerman, A.E., 2002. Tannin chemistry.

<http://www.users.muohio.edu/hagermae/tannin.pdf>, accessed 5<sup>th</sup> July 2002.

Hagerman, A.E., Butler, L.G., 1978. Protein precipitation method for the quantitative determination of tannins. *Journal of Agricultural and Food Chemistry* 26, 809-812.

Hagerman A.E., Butler L.G., 1980. Condensed tannin purification and characterization of tannin-associated proteins. *Journal of Agricultural and Food Chemistry* 28, 947-952.

Hagerman, A.E., Butler, L.G., 1981. the specificity of proanthocyanidin-protein interactions. *The Journal of Biological Chemistry* 256, 494-497.

Hagerman, A.E., Butler, L.G., 1993. The specificity of proanthocyanidin-protein interactions. *Journal of Biological Chemistry* 256, 4494-4497.

Hagerman, A.E. and Klucher, K.M., 1986. Tannin-protein interactions, in: Cody, V., Middleton. E., Harborne, J. (Eds.), *Plant Flavonoids in Biology and Medicine: Biochemical, Pharmacological and Structure Activity Relationships*, Alan R. Liss, New York, pp. 67-76.

Hagerman, A.E. and Robbins C.T., 1987. Implications of soluble tannin-protein complexes for tannin analysis and plant defense mechanism. *Journal of Chemical Ecology*, 13 1243-1259.

Hagerman, A.E., Rice, M.E., Ritchard, N.T., 1998. Mechanisms of protein precipitation for two tannins, pentagalloyl glucose and epicatechin<sub>16</sub> (4→8) catechin (procyanidin). *Journal of Agricultural and Food Chemistry* 46, 2590-2595.

Hahn, D.H., Rooney, L.W., Earp, C.F., 1984. Tannins and phenols of sorghum. *Cereal Foods World* 29, 776-779.

Hamaker, B.R., Mohamed, A.A., Habben, J.E., Huang, C.P., Larkins, B.A., 1995. Efficient procedure for extracting maize and sorghum kernel proteins

reveals higher prolamin contents than conventional method. Cereal Chemistry 72, 583-588.

Haslam E., 1996. Natural polyphenols (vegetable tannins) as drugs: Possible mode of action. Journal of Natural Products 59, 205-215.

Haslam. E., Lilley, T.H., Warmiski, E., Liao, H., Cai, Y., Martin, R., Gaffney, S.H., Goulding P.N., Luck, G., 1992. Polyphenol complexation, study of molecular recognition, in: Ho, C.T., Lee, C.Y., Huang, M.T. (Eds.), Phenolic Compounds in Food and Their Effects on Health. I, Analysis, Occurrence and Chemistry, American Chemical Society, Washington, DC, pp. 8-51.

Heijman, F.H., Du Pont, J.S., Middelkoop, E., Kreis, R.W., Hoekstra, M.J., 1997. Cross-linking dermal sheep collagen with tannic acid. Biomaterials 18, 749-754.

Hulse, J.H., Liang, E.M., Pearson, D.E., 1980. Sorghum and the Millets: Their Composition and Nutritive Value, Academic Press, London, pp. 81-91.

International Organization for Standardization, 1988. Sorghum: determination of tannin content, ICS:67.060, Food Technology: Cereals, Pulses and Derived products. International Organization for Standardization, ISO 9648, Paris.

Jangchud, A., Chinnan, M.S., 1999. Peanut protein film as affected by drying temperature and pH of film forming solution. Journal of Food Science 64, 153-157.

Jeanjean, M.F., Damidaux, R., Feillet, P., 1980. Effect of heat treatment on protein solubility and visco-elastic properties of wheat gluten. Cereal Chemistry 57, 325-331.

Jin, X., Ellis, T.S., Karasz, F.E., 1984. The effect of crystallinity and cross-linking on depression of the glass transition temperature in nylon 6 by water. Journal of Polymer Science 22, 1701-1717.

Johns, C.O., Brewster, J.F., 1916. Kafirin, an alcohol soluble protein from kafir, andropogon sorghum. *Journal of Biological Chemistry* 28, 59-65.

Jones, R.W., Beckwith A.C., 1970. Proximate composition and proteins of three grain sorghum hybrids and their dry-milled fractions. *Journal of Agricultural and Food Chemistry* 18, 33-36.

Kaluza, W.Z., McGrath, R.M., Roberts, T.C., Schröder, H.H., 1980. Separation of sorghum phenolics of *Sorghum bicolor* (L.) Moench grain. *Journal of Agricultural and Food Chemistry* 28, 1191-1196.

Kawamoto, H., Nakatubo, F., 1997. Effects of environmental factors on two stage tannin protein co-precipitation. *Phytochemistry* 46, 479-483.

Kawamoto, H., Nakatubo, F., Murakami, J., 1996. Stoichiometric studies of tannin-protein co-precipitation. *Phytochemistry* 41, 1427-1431.

Kayserilioglu, B.S., Bakir, U., Yilmaz, L., Akkas, N., 2003. Use of xylan, an agricultural by-product, in wheat gluten biodegradable based films: Mechanical, solubility and water vapour transfer rate properties. *Bioresource Technology* 87, 239-246.

Kemp, W., 1987. *Organic spectroscopy*, second edition, English Language Book Society/Macmillan, Basingstoke, pp. 12-81.

Kerry, N.L., Abbey, M., 1997. Red wine and fractionated phenolic compounds prepared from red wine inhibit low density lipoprotein oxidation in vitro. *Atherosclerosis*, 145, 93-102.

Kester, J.J., Fennema, O.R., 1986. Edible films and coatings: A review. *Food Technology* 40 (12), 47-56.

Krochta, J.M., 1986. Film edible, in: Bakker, M. (Ed.), the Wiley Encyclopedia of Packaging Technology, John Wiley and Sons, New York, pp. 397-401.

Kretschmer, C.B., 1957. Infrared spectroscopy and optical rotatory dispersion of zein, wheat gluten and gliadin. *Journal of Physical Chemistry* 61, 1627-1631.

Krueger, C.G., Vestling, M.M., Reed J.D., 2003. Matrix-assisted laser desorption/ionization time of flight mass spectrometry of heteropolyflavan-2-ol and glycosylated heteropolyflavans in sorghum (*Sorghum bicolor* (L.) Moench). *Journal of Agricultural and Food Chemistry* 21, 538-548.

Lai, H.M., Padua, G.W., 1998. Water vapor barrier properties of zein films plasticized with oleic acid. *Cereal Chemistry* 75, 194-199.

Larkins, B.A., Pedersen, K., Marks, M.D., Wilson, D.R., 1984. The zein proteins of maize endosperm. *Trends in Biochemical Sciences* 9, 306-308.

Larre, C., Desserme, C., Barbot, J., and Guegen, J., 2000a. Properties of deamidated gluten films enzymatically cross-linked. *Journal of Agricultural and Food Chemistry* 48, 5444-5449.

Larre, C., Denery-papini, S., Popineau, Y., Deshayes, G., Desserme, C., Lefebvre, J., 2000b. Biochemical analysis and rheological properties of gluten modified by transglutaminase. *Cereal Chemistry* 72, 121-127.

Lawton, J.W., 2002. Zein: A history of processing and use. *Cereal Chemistry* 79, 1-18.

Lens, J.P., Mulder, W.J., Kolster, P., 1999. Modification of wheat gluten for non food applications. *Cereal Foods World* 44, 5-9.

Lieberman, E.R., Guilbert, S.G., 1973. Gas permeation of collagen films as affected by cross-linkage, moisture and plasticizer content. *Journal of Polymer Science* 41, 33-43.

Li-Chan, E.C.Y., 1996. The applications of Raman spectroscopy in food science. *Trends in Food Science and Technology* 7, 361-370

Lindsay, R.C., 1985. Food additives, in: Fennema O.R. (Ed.), *Food Chemistry*, second edition, Marcel Dekker Inc., New York, pp. 664-665.

Lu, Y., Bennick, A., 1998. Interaction of tannin with human salivary proline rich proteins. *Archives of Oral Biology* 43, 717-728.

Luck, G., Liao, H., Murray, N.J., Grimmer, H.R., Warminski, E.E., Williamson, M.P., Lilley, T.H., Haslam, E., 1994. Polyphenols, astringency and proline rich proteins. *Phytochemistry* 37, 357-371.

Madeka, H., Kokini, J.L., 1996. Effect of glass transition and cross-linking on rheological properties of zein: Development of preliminary state diagram. *Cereal Chemistry* 73, 433-438.

Mauer, L.J., Smith, D.E., Labuza, T.P., 2000. Water vapour permeability, mechanical and structural properties of edible  $\beta$ -casein films. *International Dairy Journal* 10, 353-358.

McAnlis, G.T., McEneny, J., Pearce, J., Young, I.S., 1999. Absorption and antioxidant effects of quercetin from onions, in man. *European Journal of Clinical Nutrition* 53, 92-96

McGrath, R.M., Smith, A., 1990. The isolation of large molecular mass procyanidins from grain sorghum and their interaction with [ $^{14}\text{C}$ ] methyl bovine serum albumins. *International Journal of Biochemistry* 22, 1491-1496.

McGuire, R.G. and Baldwin, E.A., 1996. Lychee colour can be better maintained in storage through application of low pH cellulose coatings. *Proceedings of Florida State of Horticultural Society* 109, 272-275.

McHugh, T.H., Krochta, J.M., 1994. Sorbitol vs glycerol- plasticized whey protein edible films: Integrated oxygen permeability and tensile property evaluation. *Journal of Agricultural and Food Chemistry* 42, 841-845.

McHugh, T.H., Huxoll, C.C., Krochta, J.M., 1996. Permeability properties of fruit puree edible films. *Journal of Food Science* 61, 88-91.

McManus, J.P., Davis, K.G., Beart, J.E., Gaffney, S.H., Lilley, T.E., Haslam, E., 1985. Polyphenol interactions: Some observations on reversible complexation of polyphenols with proteins and polysaccharides. *Journal of the Chemical Society Perkin Transactions* 11, 1429-1438.

Merlin, J.C., Statoua. A., Cornard, J.P., Saidi-Idrissi, M., Brouillard, R., 1993. Resonance Raman spectroscopic studies of anthocyanins and anthocyanidins in aqueous solutions. *Phytochemistry* 35, 227-232

Mezgheni, E., Vachon, C., Lacroix, M., 1998. Biodegradability behaviour of cross-linked calcium caseinate films. *Biotechnology Progress* 14, 534-536.

Micard, V., Belamri, R., Morel, M.H., Guilbert, S., 2000. Properties of chemically and physically treated wheat gluten films. *Journal of Agricultural and Food Chemistry* 48, 2948-2953.

Miflin, B.J., Burgess, S.R., Shewry, P.R., 1981. The development of protein bodies in storage tissues of seeds: Subcellular separations of homogenates of barley, maize and wheat endosperms and of pea cotyledons. *Journal of Experimental Botany* 32, 199-219.

Mizutani, Y., Matsumura, Y., Imamura, K., Nakanishi, K., Mori, T., 2003. Effects of water activity and lipid addition on secondary structure in powder systems. *Journal of Agricultural and Food Chemistry* 51, 229-235.

Mole, S., Waterman, P.G., 1987. A critical analysis of techniques for measuring tannins in ecological studies. *Oecologia* 72, 137-147.

Morris, T.M., 1987. The relationship between haze and the size of particles in beer. *Journal of the Institute of Brewing* 93, 13-17.

Murray, N.J., Williamson, M.P., 1994. Conformational study of a salivary proline rich protein repeat sequence. *European Journal of Biochemistry* 219, 915-921.

Murray, N.J., Williamson, M.P., Lilley, T.H., Haslam, E., 1994. Study of the interaction between salivary proline rich proteins and a polyphenol by <sup>1</sup>H NMR spectroscopy. *European Journal of Biochemistry* 219, 923-935.

Murty, D.S., Kumar, K.A., 1995. Traditional uses of sorghum and millets, in: Dendy, D.A.V. (Ed.), *Sorghum and Millets: Chemistry and Technology*, American Association of Cereal Chemists, St Paul, MN, pp. 185-222.

Nguz, K., Huyghebaert, A., 1998. Effects of tannin concentration on *in vitro* protein digestibility of some African sorghums (*Sorghum bicolor* (L. Moench)) varieties. *Sciences des Aliments* 18, 293-300.

Nguz, K., Van Gaver, D., Huyghebaert, A., 1998. *In vitro* inhibition of digestive enzymes by sorghum condensed tannins (*Sorghum bicolor* (L. Moench)). *Sciences des Aliments* 18, 507-514.

Nip, W.K., Burns, E.E., 1969. Pigment characterization in grain sorghum, I, red varieties. *Cereal Chemistry* 43, 490-496.

Nyambi, B., Ndlovu, L.R., Read, J.S., Reed, J.D., 2000. The effects of sorghum proanthocyanidins on digestive enzyme activity *in vitro* and in digestive tract of chicken. *Journal of the Science of Food and Agriculture* 80, 2223-2231.

Oh, H.I., Hoff, J.E., Armstrong, G.S., Haff, L.A., 1980. Hydrophobic interaction in tannin-protein complexes. *Journal of Agricultural and Food Chemistry* 28, 394-398.

Okamoto, S., 1978. Factors affecting protein film formation. *Cereal Foods World* 23, 256-262.

Orliac, O., Rouilly, A., Silvestre F., Rigal, L., 2002. Effects of additives on the mechanical properties, hydrophobicity and water uptake of thermo-moulded films produced from sunflower protein isolate. *Polymer* 43, 5417-5425.

Omoike, A.I., and Vanloon, G.W., 1999. Removal of phosphorus and organic matter by alum during waste treatment. *Water Resource* 33, 3617-3627.

Ozaki, A., Kitano, M., Furusawa, N., Yamaguchi, H., Kuroda, K., Endo, G., 2002. Genotoxicity of gardenia yellow and its components. *Food and Chemical Toxicology* 40 1603-1610.

Park, H.J., Chinnan, M.S., 1990. Properties of edible coatings for fruits and vegetables. American Society of Agricultural Engineers paper no. 90-6510, St. Joseph, MI.

Park, H.J., Chinnan, M.S., Shewfelt, R.L., 1994. Edible corn-zein film coatings to extend storage life of tomatoes. *Journal of Food Processing and Preservation* 18, 317-331.

Parris, N., Coffin, D.R., 1997. Composition factors affecting the water vapour permeability and tensile properties of hydrophilic zein films. *Journal of Agricultural and Food Chemistry* 45, 1596-1599.

Parris, N., Coffin, D.R., Dickey, L.C., Craig, J.C., 1998. Composition factors affecting the physical properties of hydrophilic zein films, in: Sessa, D.J. and Willet, J.L. (Eds.), *Proceeding for Successful Utilization of Renewable Resources*, American Oil Chemists Society Press, Champaign, IL, pp. 255-265.

Pascat, B., 1986. Study of some factors affecting permeability, in: Mathlouthi, M. (Ed.), Food Packaging and Preservation: Theory and Practice, Elsevier Applied Science Publishers, New York, pp. 2-24.

Pasch, H. Pizzi, A., 2002. Considerations on the macromolecular structure of chestnut ellagitannins by matrix-assisted laser desorption/ionization-time-of-flight mass spectrometry. *Journal of Applied Polymer Science* 85, 429-437.

Pasch, H., Pizzi, A., Rode, K., 2001. MALDI-TOF mass spectrometry of polyflavonoid tannins. *Polymer* 42, 7531-7539.

Paull, R.E., Reyes, M.E.Q., Reyes, M.V., 1998. Sulfite residues on litchi fruit treated with sulfur dioxide. *Postharvest Biology and Technology* 14, 229-233.

Petersen, K., Nielsen, P.V., Bertelsen, G., Lawther, M., Olsen, M.B., Nilsson, N.H., Mortensen G., 1999. Potential of biobased material for food packaging. *Trends in Food Science and Technology* 10, 52-68.

Pielesz, A., Freeman, H.S., Weselucha-Bircynska, A., Wysocki, M., Wlochowicz, A., 2003. Assessing the structure of a dyed wool fibre by means of FTIR and FTR spectroscopies. *Journal of Molecular Structure* 651-653, 405-418.

Pierpont, W.S., 1969. O-quinones formed in plant extracts, their reactions with amino acid and peptides. *Biochemical Journal* 112, 609-618.

Pol, H., Dawson, P., Acton, J., Ogale, A., 2002. Soy protein isolate/corn zein laminated films: transport and mechanical properties. *Journal of Food Science* 67, 212-217.

Pommet, M., Redl, A., Morel, M.H., Guilbert, S., 2003. Study of wheat gluten plasticization with fatty acids. *Polymer* 44, 115-122.

Rao, P.V.R., Rao, G.R., 2002. Vibrational analysis of substituted phenols, Part I, vibrational spectra, normal coordinate analysis and transferability of force constants of some formyl-, methoxy-, formylmethoxy-, methyl- and halogeno-phenols. *Spectrochimica Acta part A* 58, 3039-3065.

Ray, P.K., 1998. Postharvest handling of litchi fruits in relation to colour retention-A critical appraisal. *Journal of Food Science and Technology, India* 35, 103-116.

Rayner, M., Ciolfi, V., Maves, B., Stedman, P., Mittal, G.S., 2000. Development and application of soy protein films to reduce fat intake in deep fried foods. *Journal of the Science of Food and Agriculture* 80, 777-782.

Rhim, J.W., Gennadios, A., Fu, D., Weller, C.L., Hanna, M.A., 1999. Properties of ultraviolet irradiated protein films. *Lebensmittel-Wissenschaft und Technologie* 332, 129-133.

Riedl, K.M., Hagerman, A.E., 2001. Tannin-protein complexes as radical scavengers and radical sinks. *Journal of Agricultural and Food Chemistry* 49, 4917-4923.

Rieger, J., 2001. The glass transition temperature of polymers, comparison of values from differential thermal analysis (DTA, DSC) and dynamic mechanical measurements (torsion pendulum). *Polymer Testing* 20, 199-204.

Rubino, M.I., Arntfield, S.D., Nadon, C.A., Bernatsky, A., 1996. Phenolic protein interactions in relation to gelation properties of canola protein. *Food Research International* 29, 653-659.

Salame, M., 1986. Barrier polymers, in: Bakker, M. (Ed.), *The Wiley Encyclopedia of Packaging Technology*, John Wiley and Sons, New York, pp. 46-54.

Santosa, F.X.B., Padua, G.W., 2000. Thermal behavior of zein sheets plasticized with oleic acid. *Cereal Chemistry* 77, 459-462.

Sarni-Manchado, P., Cheynier, V., Moutounet, M., 1999. Interactions of grape seed tannins with salivary proteins. *Journal of Agricultural and Food Chemistry* 47, 42-47.

Scalbert, A., Morand, C., Manach, C. and Remesy, C., 2002. Absorption and metabolism of polyphenols in gut and impact on health. *Biomedicine and Pharmacotherapy* 56, 276-282

Schacht, E., Bogdanov, B., Van den Bulcke, A., De Rooze, N., 1997. Hydrogels prepared by cross-linking of gelatin with dextran dialdehyde. *Reactive and Functional Polymers* 33, 109-116.

Schlimate, D.V., Rooney, M.L., 1994. Packaging of minimally processed fruits and vegetables, in: Wiley, R.C. (Ed.), *Minimally Processed Refrigerated Fruits and Vegetables*, Chapman and Hall, New York, pp. 135-182.

Sears J.K., Darby, J.R., 1982. *The Technology of Plasticizers*, John Wiley and Sons, New York, pp. 35-77.

Serna-Saldivar, S., Rooney, LW. 1995. Structure and chemistry of sorghum and millets, in: Dendy, D.A.V. (Ed.), *Sorghum and Millets: Chemistry and Technology*, American Association of Cereal Chemists, St Paul, MN, pp. 69-124.

Shaw, N.B., Monahan, F.J., O'Riordan, E.D., O'Sullivan, M., 2002. Physical properties of whey protein isolate films plasticized with glycerol, xylitol, or sorbitol. *Journal of Food Science* 67, 164-167.

Shull, J.M., Watterson, J.J., Kirleis, A.W., 1991. Proposed nomenclature for alcohol soluble proteins (kafirins) of *Sorghum bicolor* (L. Moench) based on

molecular weight, solubility and structure. *Journal of Agricultural and Food Chemistry* 39, 83-87.

Shull, J.M., Watterson, J.J., Kirleis A.W., 1992. Purification and immunocytochemical localization of kafirins in *Sorghum bicolor* (L. Moench) endosperm. *Protoplasma* 171, 64-74.

Siebert, K.J., Lynn, P.Y., 1998. Comparison of polyphenol interactions with polyvinyl pyrrolidone and haze active protein. *Journal of the American Society of Brewing Chemists* 56, 24-31.

Siebert, K.J., Troukhanova, N.V., Lynn, P.Y., 1996. Nature of polyphenol-protein interactions. *Journal of Agricultural and Food Chemistry* 44, 80-85.

Sigma, 2002. Biochemicals and Reagents for Life Science Research. Sigma®, Atlasville, South Africa.

Singh, B.R., 2000. Basic aspects of the technique and applications of infrared spectroscopy of peptides and proteins, in: Singh B.R. (Ed.), *Infrared Analysis of Peptides and Proteins, Principles and Application*, American Chemical Society symposium series, American Chemical Society, Washington, DC, pp. 2-37.

Skerritt, J.H., 1988. Immunochemistry of cereal grain storage proteins, in: Pomeranz, Y. (Ed.), *Advances in Cereal Science and Technology*, Vol IX, American Association of Cereal Chemists, St Paul, MN, pp. 263-338.

Slade, L., Levine, H., Finley, J.W., 1989. Protein-water interactions: water as plasticizer of gluten and other proteins, in: Phillips, R.D., Finley, J.W. (Eds.), *Protein Quality and the Effects of Processing*, Marcel Dekker, New York, pp. 9-124.

Smith, S.A., 1986. Polyethylene, in: Bakker, M. (Ed.). *The Wiley Encyclopedia of Packaging Technology*, John Wiley and Sons, New York, pp. 48-54.

Sobral, P.G.A., Menegalli, F.C., Hubinger, M.D., Roques, M.A., 2001. Mechanical, water vapour barrier and thermal properties of gelatin based edible films. *Food Hydrocolloids* 15, 423-432.

Spencer, C.M., Cai, Y., Martin, R., Graffney, S.H., Goulding, P.N., Magnolato, D., Lilley, T.H., Haslam, E., 1988. Polyphenol complexation- some thoughts and observations. *Phytochemistry* 27, 2397-2409.

Stading, M., Rindlav-Westling, A., Gatenholm, P., 2001. Humidity-induced structural transitions in amylose and amylopectin films. *Carbohydrate Polymers* 45, 209-217.

Steel, R.G.D., Torrie J.H., 1984. *Analysis of Variance, Principles and Procedures of Statistics, a Biometrical Approach*, McGraw- Hill, Tokyo, pp. 336-375.

Surewicz W.K., Mantsch, H.H., 1988. New insight into protein secondary structure from resolution-enhanced infrared. *Biochimica et Biophysica Acta* 952, 115-130.

Taylor, J.R.N., 1983. Effect of malting on the protein and free amino nitrogen of sorghum. *Journal of the Science of Food and Agriculture* 34, 885-892.

Taylor, J.R.N., Belton, P.S., 2002. Sorghum, in: Belton, P.S., Taylor, J.R.N., (Eds.), *Pseudocereals and Less Common Cereals*, Springer, Berlin, pp. 24-91.

Taylor, J.R.N., Boyd H.K., 1986. Free  $\alpha$ -amino nitrogen production in sorghum beer mashing. *Journal of the Science of Food and Agriculture* 37, 1109-1117.

Taylor, J.R.N., Schüssler, L., 1986. The protein composition of the different anatomical parts of sorghum grain. *Journal of Cereal Science* 4, 361-369.

Taylor, J.R.N., Novellie, L., Liebenberg, N.v.d.W, 1984b. Sorghum protein body composition and ultrastructure. *Cereal Chemistry* 61, 69-73.

Taylor, J.R.N., Schüssler, L., Van der Walt, W.H., 1984a. Fractionation of proteins from low tannin sorghum grain. *Journal of Agricultural and Food Chemistry* 32, 149-154.

Thekallat, V., Sargent, S.A., Maul, F, 1997. Controlled atmosphere storage shows potential for maintaining postharvest quality of lychee fruits. *Proceedings of the 7<sup>th</sup> International Controlled Atmosphere Research Conference*, 13-16 July 1997, Davis, CA, pp. 83-89.

Thygesen, L.G., Lokke, M.M., Micklander, E., Engelsen S.B., 2003. Vibrational microspectroscopy of food, Raman vs FTIR. *Trends in Food Science and Technology* 14, 50-57.

Tien C.L., Letendre, M., Ispas-Szabo, P., Matescu, M.A., Delmas-Patterson, G., Yu, H.L., Lacroix, M., 2000. Development of biodegradable films from whey proteins by cross-linking and entrapment in cellulose. *Journal of Agricultural and Food Chemistry* 48, 5566-5575.

Trezzia, T.A., Krochta, 2002. Application of edible coatings to nuts and nut-containing food products, in: Gennadios, A. (Ed.), *Protein-based Films and Coatings*, CRC Press, Washington, DC, pp. 527-550.

Underhill, S.J.R., 1992. Lychee (*Litchi chinensis* Sonn.) pericarp browning. *Tropical Science* 32, 305-312.

Underhill, S.J.R., Critchley, C., 1994. Anthocyanin decolorisation and its role in lychee pericarp browning. *Australian Journal of Experimental Agriculture* 34, 115-122.

Underhill, S.J.R., Simons, D.H., 1993. Lychee (*Litchi chinensis* Sonn.) pericarp dessication and the importance of postharvest microcracking. *Scientia Horticulturae* 54, 287-294.

Underhill, S.J.R., Gardiner, S., Prasad, A., 1994. The use of sulphur dioxide and low pH treatment control lychee (*Litchi chinensis* Sonn.) pericarp browning. *Proceedings of the Australian Centre for International Agricultural Research* 58, 30-35.

Vachon, C., Yu, H.L., Yefsah, R., Alain, R., St. Gelais, D., Lacroix, M., 2000. Mechanical and structural properties of milk protein edible films cross-linked by heating and  $\gamma$ -irradiation. *Journal of Agricultural and Food Chemistry* 48, 3202-3209.

Van de Velde, K., Kiekens, P., 2002. Biopolymers: Overview of several properties and consequences on their applications. *Polymer Testing* 21, 433-442.

Van Heerden, I.V., 1987. Nutrient content of sorghum beer strainings. *South African Journal of Animal Science* 17, 171-175.

Waniska, R.D., Poe, J.H., Bandyopadhyay, R., 1989. Effects of growth conditions on grain moulding and phenols in the sorghum caryopsis. *Journal of Cereal Science* 10, 217-225.

Watada, A.E., Ko, N.P., Minott, D.A., 1996. Factors affecting quality of fresh-cut horticultural products. *Postharvest Biology and Technology* 9, 115-125.

Watterson, J.J., Shull, J.M., Kirleis, A.W., 1993. Quantitation of  $\alpha$ ,  $\beta$  and  $\gamma$  kafirin in vitreous and opaque endosperm of *Sorghum bicolor*. *Cereal Chemistry* 70, 452-457.

- Watterson, J.J., Shull, J.M., Mohamed, A.M.A., Reddy, V., Kirleis, A.W., 1990. Isolation of high cysteine kafirin protein and its cross-reactivity with gamma zein antiserum. *Journal of Cereal Science* 12, 137-144.
- Weller, C.L., Gennadios, A., Saraiva, R.A., 1998. Edible bilayer films from zein and grain sorghum wax or carnauba wax. *Lebensmittel-Wissenschaft und Technologie* 31, 279-285.
- Were, L., Hettiarachy, N.S., Coleman, M., 1999. Properties of cysteine-added soy protein wheat gluten films. *Journal of Food Science* 63, 514-518.
- Yan, Q., Bennick, A., 1995. Identification of histatins as tannin-binding proteins in human saliva. *Biochemical Journal* 311, 341-347.
- Yang, L., Paulson, A.T., 2000. Mechanical and water vapor barrier properties of edible gellan films. *Food Research International* 33, 563-570.
- Yoshino, T., Isobe, S., Maekawa, T., 2002. Influence of preparation conditions on the physical properties of zein films. *Journal of the American Oil Chemists Society* 79, 345-349.
- Zauberan, G., Ronen, R., Akerman, M., Weksler, A., Rot, I., Fuchs, Y., 1991. Postharvest retention of red colour of litchi fruit pericarp. *Scientia Horticulturae* 47, 89-97.

## SCIENTIFIC CONTRIBUTIONS

### Publications:

Emmambux, N.M., Taylor, J.R.N., 2003. Sorghum kafirin interaction with various phenolic compounds. *Journal of the Science of Food and Agriculture* 83,402-207).

Emmambux, N.M., Stading, M., Taylor, J.R.N. Sorghum kafirin film property modification with hydrolysable and condensed tannins. *Journal of Cereal Science* (Submitted in November 2003).

Taylor J. R. N., Byaruhanga Y. B., Emmambux N. M., Erasmus C., De Waal D., Belton, P.S. Effect of microwave heating and tannin binding on the structure of kafirin. *Food Chemistry* (Submitted)

### Poster presentation:

Emmambux MN and Taylor JRN. Sorghum kafirin interaction with various polyphenols. International Association of Cereal Science and Technology Conference, Budapest, May 2002.

Received Best Doctoral Student Poster Award and Overall Best Poster Award at the conference

### Oral presentation:

Taylor JRN, Emmambux MN and Duodu KG, 2002. Protein interaction in condensed tannin-free sorghum. Annual meeting of the American Association of Cereal Chemists, Montreal, October, 2002.

Emmambux MN and Taylor JRN, 2003. Sorghum Kafirin film property modification with hydrolysable and condensed tannins. 2<sup>nd</sup> Young Cereal

Scientists and Technologists Workshop IATA (CSIC), Valencia, Spain July 10<sup>th</sup>-11<sup>th</sup> 2003.

Emmambux, MN and JRN Taylor, 2003. Sorghum kafirin interaction with phenolic compounds. 17<sup>th</sup> South African Association for Food Science and Technology International Congress and Exhibition, CSIR Conference Centers, Pretoria, South Africa, 1-4 September 2003.

Dreosti Award for the best research paper presented at the conference.