

6 REFERENCES

- ABDUL-KADIR, R., BARGMAN, T.J.A. & RUPNOW, J.H. 1990. Effect of infrared heat processing on rehydration rate and cooking of *Phaseolus vulgaris* (var. Pinto). *Journal of Food Science* 55, 1472-1473.
- ABU, J.D., AROGBA, S.S. & UGWU, F.M. 1999. The effects of post-harvest handling on physical, chemical and functional properties of cowpea (*Vigna unguiculata*) seed. *Journal of the Science of Food and Agriculture* 79, 1325-1330.
- ABU, J.O., MÜLLER, K., DUODU, K.G. & MINNAAR, A. 2005. Functional properties of cowpea (*Vigna unguiculata* L. Walp) flour and pastes as affected by γ -irradiation. *Food Chemistry* 93, 103-111.
- ABU, J.O., MÜLLER, K., DUODU, K.G. & MINNAAR, A. 2006a. Gamma irradiation of cowpea (*Vigna unguiculata* L. Walp) flours and pastes: Effects on functional, thermal and molecular properties of isolated proteins. *Food Chemistry* 95, 138-147.
- ABU, J.O., MÜLLER, K., DUODU, K.G. & MINNAAR, A. 2006b. Effect of γ -irradiation on some physicochemical and thermal properties of cowpea (*Vigna unguiculata* L. Walp) starch. *Food Chemistry* 95, 386-393.
- ADEBOWALE, K.O., OLU-OWOLABI, B.I., OLAWUMI, E.K. & LAWAL, O.S. 2005. Functional properties of native, physically and chemically modified breadfruit (*Artocarpus artillis*) starch. *Industrial crops and products* 21, 343-351.
- AFOAKWA, E.O., YENYI, S.E. & SAKYI-DAWSON, E. 2006. Response surface methodology for optimizing the pre-processing conditions during canning of a newly developed and promising cowpea (*Vigna unguiculata*) variety. *Journal of Food Engineering* 73, 346-357.

AGBO, G.N., HOSFIELD, G.L., UEBERSAX, M.A. & KIMPARENS, K. 1987. Seed microstructure and its relationship to water uptake in isogenic lines and a cultivar of dry beans (*Phaseolus vulgaris, L.*). *Food Microstructure* 6, 91-102.

AGUNBIADE, S.O. & LONGE, O.G. 1999. The Physico-functional characteristics of starches from cowpea (*Vigna unguiculata*). Pigeon pea, (*Cajanus cajan*) and yambean (*Sphenostylis stenocarpa*). *Food Chemistry* 65, 469-474.

AJIBOLA, O.O., AVIARA, N.A. & AJETUMOBI, O.E. 2003. Sorption equilibrium and thermodynamic properties of cowpea (*Vigna unguiculata*). *Journal of Food Engineering* 58, 317-324.

AKINJAYEJU, O. & BISIRIYU, K.T. 2004. Comparative studies of some properties of undehulled, mechanically dehulled and manually dehulled cowpea (*Vigna unguiculata Walp. L.*) flours. *International Journal of Food Science and Technology* 39, 355-360.

AKINYELE, I.O., ONIGBINDE, A.O., HUSSAIN, M.A. & OMOLOLU, A. 1986. Physicochemical characteristics of 18 cultivars of Nigerian cowpeas (*V. unguiculata*) and their cooking properties. *Journal of Food Science* 51, 1483-1485.

AKUBOR, P.I., ISOLOKWU, O., UGBANE, O. & ONIMAWO, I.A. 2000. Proximate composition and functional properties of African breadfruit kernel and flour blends. *Food Research International* 33, 707-712.

ALUKO, R.E. & YADA, R.Y. 1993. Relationship of hydrophobicity and solubility with some functional properties of cowpea (*Vigna unguiculata*) protein isolate. *Journal of the Science of Food and Agriculture* 62, 331-335.

ALUKO, R.E. & YADA, R.Y. 1995. Structure-function relationships of cowpea (*Vigna unguiculata*) globulin isolate: influence of pH and NaCl on physicochemical and functional properties. *Food Chemistry* 53, 259-265.

ALUKO, R.E. & YADA, R.Y. 1999. Effect of a microbial calcium-independent transglutaminase on functional properties of a partially purified cowpea (*Vigna unguiculata*) globulin. *Journal of the Science of Food and Agriculture* 79, 286-290.

ALUKO, R.E., YADA, R.Y., LENCKI, R.W. & MARANGONI, A.G. 1997. Structural and functional properties of a partially purified cowpea (*Vigna unguiculata*) globulin modified with protein kinase and glycopeptidase. *Journal of Agriculture and Food Chemistry* 45, 2907-2913.

AMERICAN ASSOCIATION OF CEREAL CHEMISTS, (AACC). 2000. Approved methods of the AACC (10th Ed.) St Paul, MN:AACC.

ANDREWS, A.T. 1986. *Electrophoresis: Theory, Techniques, and Biochemical and clinical applications*. 2nd Ed. New York:Oxford Science Publications, pp 100-116.

AREMU, C.Y. 1991. Selected physico-chemical properties of five varieties of cowpea. *Food Chemistry* 41, 123-128.

ARNTFIELD, S.D., SCANLON, M.G., MALCOLMSON, L.J., WATTS, B., RYLAND, D. & SAVOIE, V. 1997. Effect of tempering and end moisture content on the quality of micronized lentils. *Food Research International* 30, 371-380.

ARNTFIELD, S.D., SCANLON, M.G., MALCOLMSON, L.J., WATTS, B.M., CENKOWSKI, S., RYLAND, D. & SAVOIE, V. 2001. Reduction in lentil cooking time using micronisation: Comparison of 2 micronisation temperatures. *Journal of Food Science* 66, 500-505.

ASSOUMANI, M.B., MAXIME, D. & NGUYEN, N.P. 1994. Evaluation of a lysine-glucose Maillard model system using three rapid analytical methods. In T.P. Labuza, G.A. Reineccius, V.M. Monnier, J. O'Brien and J.W. Baynes. *Maillard Reactions in Chemistry, Food, and Health*. Cambridge:The Royal Society of Chemistry, pp 43-50.

AUTIO, K & SALMENKALLIO-MARTTILA, M. 2001. Light microscopic investigations of cereal grains, doughs and breads. *Lebensmittel-Wissenschaft und- Technologie* 34, 18-22.

BELLIDO, G., ARNTFIELD, SD., CENKOWSKI, S. & SCANLON, M. 2006. Effects of micronization pretreatments on the physicochemical properties of navy and black beans (*Phaseolus vulgaris* L.). *Lebensmittel-Wissenschaft und - Technologie* 39, 779-787.

BILIADERIS, C.G. 1983. Differential scanning calorimetry in food research- A review. *Food Chemistry* 10, 239-265.

BILIADERIS, C.G. 1991. The structure and interactions of starch with food constituents. *Canadian Journal of Physiology and Pharmacology* 69, 60-78.

BeMILLER, J.N. & WHISTLER, R.L. 1996. Carbohydrates. In O.R. Fennema (Ed), *Food Chemistry*. New York: Marcel Dekker, pp 191-195.

BERRIOS, J.J., SWANSON, B.G. & CHEONG, W.A. 1999. Physico-chemical characterization of stored black beans (*Phaseolus vulgaris* L.). *Food Research International* 32, 669-676.

BRETT, C. & WALDRON, K. 1996. *Physiology and Biochemistry of plant cell walls*. 2nd Ed, London:Chapman & Hall, pp 222-238.

BROUWER, I.D., HARTOG, A.P., KAMWENDO, M.O.K. & HELDENS, M.W.O. 1996. Wood quality and wood preferences in relation to food preparation and diet composition in central Malawi. *Ecology of Food and Nutrition* 35, 1-13.

BYARUHANGA, Y.B., ERASMUS, C. & TAYLOR, J.R.N. 2005. Effect of microwave heating of kafirin on the functional properties of kafirin films. *Cereal Chemistry* 82, 565-573.

CAI, R., HETTIARACHCHY, N.S. & JALALUDDIN, M. 2003. High-performance liquid chromatography determination of phenolic constituents in 17 varieties of cowpeas. *Journal of Agriculture and Food Chemistry* 51, 1623-1627.

CENKOWSKI, S. & SOSULSKI, F.W. 1997. Physical and cooking properties of micronised lentils. *Journal of Food Process Engineering* 20, 249-264.

CENKOWSKI, S. & SOSULSKI, F.W. 1998. Cooking characteristics of split peas treated with infrared heat. *Transactions of the ASAE* 41, 715-720.

CENKOWSKI, S., HONG, J.T., SCANLON, M.G. & ARNTFIELD, S.D. 2003. Development of a mathematical model for high-intensity infrared processing (Micronization) of peas. *Transactions of the ASAE* 46, 705-713.

CHAN, C.W. & PHILLIPS, R.D. 1994. Amino acid composition and subunit constitution of protein fractions from cowpea (*Vigna unguiculata* L. Walp) seeds. *Journal of Agriculture and Food Chemistry* 42, 1857-1860.

CHANG, M.J., COLLINS, J.L., BAILEY, J.W. & COFFEY, D.L. 1994. Cowpeas tannins related to cultivar, maturity, dehulling and heating. *Journal of Food Science* 59, 1034-1036

CHARLEY, H. & WEAVER, C. 1998. *Foods: A scientific Approach*. 3rd Ed. New Jersey: Merrill, pp 469-476.

CLARK, A.H. & LEE-TUFNELL, C.D. 1986. Gelation of globular proteins. In J.R. Mitchell, D.A. Ledward (Eds), *Functional properties of food macromolecules*. London: Elsevier Applied Science, pp 203-272.

COLONNA, P., LELOUP, V. & BULÉON, A. 1992. Limiting factors of starch hydrolysis. *European Journal of Clinical Nutrition* 46 (Supplement 2), 17-32.

COULTATE, T.P. 2002. *Food: The chemistry of its components*. Cambridge: The Royal Society of Chemistry, 4th Ed. pp 52-57.

CZUCHAJOWSKA, Z., OTTO, T., PASZCZYNSKA, B. & BAIK, B-K., 1998. Composition, thermal behaviour, and gel texture of prime and tailings starches from Garbanzo beans and peas. *Cereal Chemistry* 75, 466-472.

DAMODARAN, S. 1996a. Amino acids, peptides, and proteins. In O. Fennema, (Ed), *Food Chemistry*, 3rd Ed. New York:Marcel Dekker Inc, pp 321-430.

DAMODARAN, S. 1996b. Functional properties. In S. Nakai and H.W. Modler, *Food Protein: Properties and characterization*, New York: Wiley-VCH, pp 167- 234.

DAVIES, K.J.A. 1987. Protein damage and degradation by oxygen radicals. I. General aspects. *The Journal of Biological Chemistry* 262, 9895-9901.

DAVIES, K.J.A., DELSIGNORE, M.E. & LIN, S.W. 1987. Protein damage and degradation by oxygen radicals: II Modification of amino acids. *The Journal of Biological Chemistry* 262, 9902-9907.

DAVIS, D.W., OELKE, E.A., OPLINGER, E.S., DOLL, J.D., HANSON, C.V. & PUTNAM, D.H., 1991. *Cowpea: Alternative Field Crops Manual*. www.hort.purdue.edu/newcrop/afcm/cowpea.html; Last accessed in May 2006.

DEMOOY, B.G. & DEMOOY, C.J. 1990. Evaluation of cooking time and quality of seven diverse cowpea (*Vigna unguiculata* (L) Walp) varieties. *International Journal of Food Science and Technology* 25, 209-212.

DeToro, A.A. 1993. Influence of storage temperature and moisture content on cooking time of yellow peas and brown beans. *Swedish Journal of Agricultural Research* 23, 191-197.

DIEHL, J.F. 1990. *Safety of Irradiated Foods*. New York: Marcel Dekker Inc, pp 70.

EHLERS, J.D. & HALL, A.E. 1997. Cowpea (*Vigna unguiculata* L. Walp). *Field Crops Research* 53, 187 – 204.

ENWERE, N.J., McWATTERS, K.H. & PHILLIPS, R.D. 1998. Effect of processing on some properties of cowpea (*Vigna unguiculata*) seed, protein, starch, flour and akara. *International Journal of Food Sciences and Nutrition* 49, 365-373.

FASINA, O.O., TYLER, R.T., PICKARD, M.D. & ZHENG, G.H. 1999. Infrared heating of hulless and pearled barley. *Journal of Food Processing and Preservation* 23, 135-151.

FASINA, O., TYLER, B., PICKARD, M., ZHENG, G. & WANG, N. 2001. Effect of infrared heating on the properties of legume seeds. *International Journal of Food Science and Technology* 36, 79-90.

FENNEMA, O.R. & TANNENBAUM, S.R. 1996. Introduction to food chemistry. In O.R. Fennema (Ed), *Food Chemistry*. New York:Marcel Dekker, pp 30-31.

FERREIRA, R.B., FRANCO, E. & TEIXEIRA, A.R. 1999. Calcium and magnesium dependent aggregation of legume seed storage proteins. *Journal of Agricultural and Food Chemistry* 47, 3009-3015.

FERREIRA, R.B., FREITAS, R.L. & TEIXEIRA, A.R. 2002. Self aggregation of legume seed storage proteins inside the protein storage vacuoles is electrostatic in nature, rather than lectin mediated. *FEBS Letters* 534, 106-110.

FINLEY, J.W. 1989. Effects of processing on proteins: An overview. In R.D. Phillips, J.W. Finley, (Eds), *Protein quality and the effects of processing*. New York:Marcel Dekker, pp 1-7.

FISHER, L.R., CARRINGTON, S.P. & ODELL, J.A. 1997. Deformation mechanics of individual swollen starch granules. In P.J. Frazier, A.M. Donald, P. Richmond (Eds) *Starch: Structure and Functionality*. Cambridge:The Royal Society of Chemistry, pp 105-114.

FREIFELDER, D. 1982. *Physical Biochemistry: Applications to biochemistry and molecular biology*. 2nd Ed. New York:Freeman and Company, pp 205-210, 276, 493-537. 537-556.

FREITAS, R.L., TEIXEIRA, A.R. & FERREIRA, R.B. 2004. Characterization of the proteins from *Vigna unguiculata* seeds. *Journal of Agricultural and Food Chemistry* 52, 1682-1687.

GERRARD, J.A. 2002. Protein-protein crosslinking in food: methods, consequences, applications. *Trends in Food Science and Technology* 13, 391-399.

GERRARD, J.A. & BROWN, P.K. 2002. Protein crosslinking in food: mechanisms, consequences, applications. *International Congress Series* 1245, 211-215.

GIAMI, S.Y. 1993. Effect of processing on the proximate composition and functional properties of cowpea (*Vigna unguiculata*) flour. *Food Chemistry* 47, 153-158.

GIAMI, S.Y. 2005. Compositional and nutritional properties of selected newly developed lines of cowpea (*Vigna unguiculata* L Walp). *Journal of Food Composition and Analysis* 18, 665-673.

GIBSON, T.S., SOLAH, V.A. & McCLEARY, B.V. 1997. A procedure to measure amylose in cereal starches and flours with Concanavalin A. *Journal of Cereal Science* 25, 111-119.

GONZALEZ, Z. & PEREZ, E. 2002. Evaluation of lentil starches modified by microwave irradiation and extrusion cooking. *Food Research International* 35, 415-420.

GRIFFITH, L.D. & CASTELL-PEREZ, M.E. 1998. Effects of roasting and malting on physicochemical properties of select cereals and legumes. *Cereal Chemistry* 75, 780-784.

HALL. A.E., CISSE, N., THIAW, S., ELAWAD, H.O.A., EHLERS, J.D., ISMAIL, M.A., FERY, R. L., ROBERTS, P.A., KITCH, L.W., MURDOCK, L.L, BOUKAR, O., PHILLIPS, R.D. & McWATTERS, K.H. 2003. Development of cowpea cultivars and germplasm by the bean/cowpea CRSP. *Field Crops Research* 4162, 1-32.

HALLÉN, E., İBANOĞLU, Ş. & AINSWORTH, P. 2004. Effect of fermented/germinated cowpea flour addition on the rheological and baking properties of wheat flour. *Journal of Food Engineering* 63, 177-184.

HARDING, S.E. 1997. The intrinsic viscosity of biological macromolecules, progress in measurement, interpretation and application to structure in dilute solutions. *Progress in Biophysical and Molecular Biology* 68, 207-262.

HARRIS, N. & BOULTER, D. 1976. Protein body formation in cotyledons of developing cowpea (*Vigna unguiculata*) seeds. *Annals of Botany* 40, 739-744.

HAYAKAWA, S. & NAKAI, S. 1985. Relationship of hydrophobicity and net charge to the solubility of milk and soy proteins. *Journal of Food Science* 50, 486-491.

HEIL, J. R., McCARTHY, M. J. & ÖZILGEN, M. 1992. Parameters for predicting canning quality of dried kidney beans. *Journal of the Science of Food and Agriculture* 60, 519-523.

HENSHAW, F.O., McWATTERS, K.H., OGUNTUNDE, A.O. & PHILLIPS, R.D. 1996. Pasting properties of cowpea flour: Effects of soaking and decortication method. *Journal of Agriculture and Food Chemistry* 44, 1864-1870.

HENSHAW, F.O., McWATTERS, K.H., AKINGBALA, J.O. & HUNG, Y.C. 2002. Functional characterization of flour of selected cowpea (*Vigna unguiculata*) varieties: canonical discriminant analysis. *Food Chemistry* 79, 381-386.

HENSHAW, F.O., McWATTERS, K.H., AKINGBALA, J.O. & CHINNAN, M.S. 2003. Thermal properties of cowpea flour: A study by differential scanning calorimetry. *Nahrung/Food* 47, 161-165.

HIRANO, H., KAGAWA, H. & OKUBO, K. 1992. Characterization of proteins released from legume seeds in hot water. *Phytochemistry* 31, 731-735.

HOHLBERG, A.I. & STANLEY, D.W. 1987. Hard to cook defect in black beans. Protein and starch considerations. *Journal of Agriculture and Food Chemistry* 35, 571-576.

HOLDE van, K.E., JOHNSON, W.C. & HO, S.P. 1998. *Principles of physical Biochemistry*. New Jersey:Prentice Hall, pp 192-240.

HOOVER, R. & MANUEL, H. 1996a. Effect of heat-moisture treatment on the structure and physicochemical properties of legume starches. *Food Research International* 29, 731-750.

HOOVER, R. & MANUEL, H. 1996b. The effect of heat-moisture treatment on the structure and physicochemical properties of normal maize, waxy maize, dull waxy maize and amylomaize V starches. *Journal of Cereal Science* 23, 153-162.

HORAX, R., HETTIARACHHY, N.S., CHEN, P. & JALALUDDIN, M. 2004a. Preparation and characterization of protein isolate from cowpea (*Vigna unguiculata* L. Walp). *Journal of Food Science* 69, 114-118.

HORAX, R., HETTIARACHHY, N.S., CHEN, P. & JALALUDDIN, M. 2004b. Functional properties of protein isolate from cowpea (*Vigna unguiculata* L. Walp). *Journal of Food Science* 69, 119-121.

HUANG, J., SCHOLS, H.A., Van SOEST, J.J.G., JIN, Z., SULMAN, E. & VORAGEN, A.G.J. In Press. Physicochemical properties and amylopectin chain profiles of cowpea, chickpea, and yellow pea starches. *Food Chemistry*.

HUNG, Y.C., McWATTERS, K.H., PHILLIPS, R.D. & CHINNAN, M.S. 1990. Effects of pre-decortication drying treatment on the microstructure of cowpea products. *Journal of Food Science* 55, 774-776, 807.

IGURA, N., HAYAKAWA, I. & FUJIO, Y. 1997. Effect of longer heating time on depolymerisation of low moisturized starches. *Starch* 49, 2-5.

JACKSON, M.G. & VARRIANO-MARSTON, E. 1981. Hard-to-Cook phenomenon in Beans: Effects of accelerated storage on water absorption and cooking time. *Journal of Food Science* 46, 799-803.

- JACKSON, D.S., WANISKA, R.D. & ROONEY, L.W. 1989. Differential water solubility of maize and sorghum starches as characterized by high-performance size exclusion chromatography. *Cereal Chemistry* 66, 228–232.
- JANE, J.L. & ROBYT, J.F. 1984. Structure studies of amylose –V complexes and retrograded amylose by action of alpha amylases, and a new method for preparing amyloextrins. *Carbohydrate Research* 132, 105-118.
- JI, Y., SEETHARAMAN, K., WONG, K., POLLAK, L.M., DUVICK, S., JANE, J. & WHITE, P.J. 2003. Thermal and structural properties of unusual starches from developmental corn lines. *Carbohydrate Polymers* 51, 439-450.
- KALAB, M., ALLAN-WOJTAS, P. & MILLER, SS. 1995. Microscopy and other imaging techniques in food structure analysis. *Trends in Food Science & Technology* 6, 177-186.
- KANWAR, R. & BALASUBRAMANIAN, D. 1999. Structure and stability of the dityrosine-linked dimer of γ B-crystallin. *Experimental Eye Research* 68, 77-784.
- KARIM, A.A., NORZIAH, M.H. & SEOW, C.C. 2000. Methods for the study of starch retrogradation. *Food Chemistry* 71, 9-36.
- KERR, W.L., WARD, C.D.W., McWATTERS, K.H. & RESURRECCION, A.V.A. 2001. Milling and particle size of cowpea flour and snack chip quality. *Food Research International* 34, 39-45.
- KETHIREDDIPALLI, P., HUNG, Y.C., PHILLIPS, R.D. & McWATTERS, K.H. 2002. Evaluating the role of cell wall material and soluble protein in the functionality of cowpea (*Vigna unguiculata*) pastes. *Journal of Food Science* 67, 53-59.

KOLBE, E. WILSON, L.A. & HARTEL, R. 1999. A round robin evaluation of differential scanning calorimetry to measure transition enthalpy. *Journal of Food Engineering* 40, 95-99.

LAI, H.M. 2001. Effects of hydrothermal treatment on the physicochemical properties of pregelatinized rice flour. *Food Chemistry* 72, 455-463.

LAI, L.S. & CHIANG, H.F. 2002. Rheology of decolorized hsian-tsao leaf gum in the dilute domain. *Food Hydrocolloids*, 16, 427–440.

LANGYINTUO, A.S., NTOUKAM, G., MURDOCK, L., LOWENBERG-DEBOER, J. & MILLER, D.J. 2004. Consumer preferences for cowpea in Cameroon and Ghana. *Agricultural Economics* 30, 203–213.

LEY, F.J., BLEBY, J., COATES, M.E. & PATTERSON, J.S. 1969. Sterilization of laboratory animal diets using gamma irradiation. *Laboratory Animals* 3, 221-254.

LIU, K., McWATTERS, K.H. & PHILLIPS, R.D. 1992. Protein insolubilization and thermal destabilization during storage as related to hard-to-cook defect in cowpeas. *Journal of Agriculture and Food Chemistry* 40, 2483-2487.

LIU, K., HUNG, Y.C. & PHILLIPS, R.D. 1993a. Mechanism of Hard-to-Cook defect in cowpeas: Verification via microstructure examination. *Food structure* 12, 51-58.

LIU, K., PHILLIPS, R.D & McWATTERS, K.H. 1993b. Mechanism of pectin changes during soaking and heating as related to hard-to-cook defect in cowpeas. *Journal of Agriculture and Food Chemistry* 41, 1476-1480.

LONGE, O.G. 1980. Carbohydrate composition of different varieties of cowpea (*Vigna unguiculata*). *Food Chemistry* 6, 153-161.

LUSH, W.M. & EVANS, L.T. 1980. The seed coats of cowpeas and other grain legumes: structure in relation to function. *Field Crops research* 3, 267-286.

McCLEARY, B.V., GIBSON, T.S. & MUGFORD, D.C. 1997. Measurement of total starch in cereal products by amyloglucosidase- α -amylase method: Collaborative study. *Journal of the Association of Official Analytical Chemistry* 80, 571-579.

McDONOUGH, C.M. & ROONEY, L.W. 1999. Use of the environmental scanning electron microscope in the study of cereal based foods. *Cereal Foods World* 44, 342-348.

McWATTERS, K.H., PHILLIPS, R.D., WALKER, S.L., MCCULLOUGH, S.E., MENSA-WILMOT, Y., SAALIA, F.K., HUNG, Y.C. & PATTERSON, S.P. 2005. Baking performance and consumer acceptability of raw and extruded cowpea flour breads. *Journal of Food Quality* 27, 337-351.

McWATTERS, K., OUEDRAOGO, J.B., RESURRECCION, V.A., HUNG, Y-C. & PHILLIPS, R.D. 2003. Physical and sensory characteristics of sugar cookies containing mixtures of wheat, fonio (*Digitaria exilis*) and cowpea (*Vigna unguiculata*) flours. *International Journal of Food Science and Technology* 38, 403-410.

MEZGHENI, E. D'APRANO, G. & LACROIX, M. 1998. Formation of sterilized edible films based on caseinates: Effect of calcium and plasticizers. *Journal of Agriculture and Food Chemistry* 46, 318-324.

MITCHELL, J.R. & HILL, S.E. 1995. The use and control of chemical reactions to enhance the functionality of macromolecules in heat-processed foods. *Trends in Food Science and Technology* 6, 219-224.

MOHSENIN, N.N. 1984. *Electromagnetic radiation properties of foods and agricultural products*. New York:Gordon and Breach Science Publishers, pp 320-328.

MOSCOSO, W., BOURNE, M.C., & HOOD, L.F. 1984. Relationship between the hard-to-cook phenomenon in red kidney beans and water absorption, puncture force, pectin, phytic acid, and minerals. *Journal of Food Science* 49, 1577-1583.

MURALIKRISHNA, G. & THARANATHAN, N. 1994. Characterization of pectic polysaccharides from pulse husks. *Food Chemistry* 50, 87-89.

MWASARU, M.A., MUHAMMAD, K., BAKAR, J. & CHE MAN, Y.B. 1999a. Effects of isolation technique and conditions on the extractability, physicochemical and functional properties of pigeon pea (*Cajanus cajan*) and Cowpea (*Vigna unguiculata*) protein isolates: I Physicochemical properties. *Food Chemistry* 67, 435-443.

MWASARU, M.A., MUHAMMAD, K., BAKAR, J. & CHE MAN, Y.B. 1999b. Effects of isolation technique and conditions on the extractability, physicochemical and functional properties of pigeon pea (*Cajanus cajan*) and Cowpea (*Vigna unguiculata*) protein isolates:II Functional properties. *Food Chemistry* 67, 435-443.

NATIONAL STATISTICAL OFFICE, 2004. 2004. Malawi Demographic and Health Survey (MDHS) Report. www.nso.malawi.net, Last accessed, May 2006.

NNANNA, I.A., PHILLIPS, R.D., MCWATTERS, K.H. & HUNG, Y-C. 1990. Effect of germination on the physical, chemical and sensory characteristics of cowpea products: Flour, paste, and akara. *Journal of Agricultural and Food Chemistry* 38, 812-816.

OLAOFE, O., UMAR, Y.O. & ADEDIRAN, G.O. 1993. The effect of nematicides on the nutritive value and functional properties of cowpea seeds. (*Vigna unguiculata* L. Walp). *Food Chemistry* 46, 337-341.

OLAPADE, A., OKAFOR, G.I., OZUMBA, A.U. & OLATUNJI, O. 2002. Characterization of common Nigerian cowpea (*Vigna unguiculata* L. Walp) varieties. *Journal of Food Engineering* 55, 101-105.

OLIVEIRA, J.T.A., PINTO, V.P.T., VASCONCELOS, I.M., FERNANDES, C.F., RAMOS, M.V., FERREIRA, F.V.A. & RIOS, F.J.B. 2004. In vitro and in vivo digestibility of the albumin and globulin fractions of eight Brazilian cowpea (*Vigna unguiculata* (L) Walp) cultivars. *Journal of the Science of Food and Agriculture* 84, 1823-1830.

OLIVER, C.M., MELTON, L.D. & STANLEY, R.A. 2006. Creating Proteins with Novel Functionality via the Maillard Reaction:A Review. *Critical Reviews in Food Science and Nutrition* 46, 337–350.

ONIGBINDE, A.O. & ONOBUN, V. 1993. Effect of pH on some cooking properties of cowpea (*V. unguiculata*). *Food Chemistry* 47, 125-127.

ONIGBINDE, A.O. & OJEABULU, P. 1999. Some chemical options for the control of hard to cook and the associated browning in boiled cowpeas (*V. unguiculata*). *Food Chemistry* 67, 353-356.

PARK, J-Y., PLAHAR, M.A., HUNG, Y-C., McWATTERS, K.H. & EUN, J-B. 2005. Effect of saponins on the foam/flow properties of paste and physical characteristics of akara made from decorticated black eyed cowpeas. *Journal of the Science of Food and Agriculture* 85, 1845-1851.

PARKER, R. & RING, S.G. 2001. Aspects of the physical chemistry of starch. *Journal of Cereal Science* 34, 1-17.

PICKARD, M.D. 1999. Heating up hog feed. *Feed News* 4, 3.

PHADI, M. M. 2004. Physico-chemical effects of micronization on cowpeas (*Vigna unguiculata* L. Walp). *MInst Agrar Dissertation*, University of Pretoria, pp 14, 38, 44-56.

PHILLIPS, R.D., CHINNAN, M.S., BRANCH, A.L., MILLER, J. & McWATTERS, K.H. 1988. Effect of pre-treatment on functional and nutritional properties of cowpea meal. *Journal of Food Science* 53, 805-809.

PHILLIPS, R.D., McWATTERS, K.H., CHINNAN, M.S., HUNG, Y.C., BEUCHAT, L.R., SEFA-DEDEH, S., SAKYI-DAWSON, E., NGODDY, P., NNANYELUGO, D., ENWERE, J., KOMEY, N.S., LIU, K., MENSA-WILMOT, Y., NNANNA, I.A., OKEKE, C., PRINYAWIWATKUL, W. & SAALIA, F.K. 2003. Utilization of cowpeas for human food. *Field Crops Research* 82, 193-213.

PHILLIPS, L.G., WHITEHEAD, D.M. & KINSELLA, J. 1994. *Structure-function properties of food proteins*. San Diego: Academic press Inc, pp 107, 179-204.

PHLAK, L.C., CALDWELL, K.B. & STANLEY, D.W. 1989. Comparison of methods used to characterize water imbibition in hard to cook beans. *Journal of Food Science* 54, 326-336.

PLAHAR, M.A., HUNG, Y-C., McWATTERS, K.H., PHILLIPS, R.D. & CHINNAN M.S. 2006. Effect of saponins on the physical characteristics, composition and quality of akara (fried cowpea paste) made from non-decorticated cream cowpeas. *Lebensmittel-Wissenschaft und- Technologie* 39, 275-284.

PRINYAWIWATKUL, W., BEUCHAT, L.R., MCWATTERS, K.H. & PHILLIPS, R.D. 1997a. Functional properties of cowpea (*Vigna unguiculata*) flour as affected by soaking, boiling and fungal fermentation. *Journal of Agricultural and Food Chemistry* 45, 480-486.

PRINYAWIWATKUL, W., BEUCHAT, L.R., McWATTERS, K.H. & PHILLIPS, R.D. 1997b. Physicochemical and sensory properties of chicken nuggets extended with fermented cowpea and peanut flours. *Journal of Agricultural and Food Chemistry* 45, 1891-1899.

PRINYAWIWATKUL, W., McWATTERS, K.H., BEUCHAT, L.R. & PHILLIPS, R.D. 1997c. Functional characteristics of cowpea (*Vigna unguiculata*) flour and starch as affected by soaking, boiling, and fungal fermentation before milling. *Food Chemistry* 58, 361-372.

PROCTOR, J.R. & WATTS, B.M. 1987a. Development of a modified Mattson Bean Cooker procedure based on sensory panel cookability evaluation. *Canadian Institute of Food Science and Technology Journal* 20, 9-14.

PROCTOR, J.R. & WATTS, B.M. 1987b. Effect of cultivar, growing location, moisture and phytate content on the cooking times of freshly harvested navy beans. *Canadian Journal of Plant Science* 67, 923-926.

RAFFI, J.J., AGNEL, J.J., FREJAVILLE, C.M. & SAINT-LEBÉ, L.R. 1981. Radio-induced products in maize starch: glyceraldehydes, dihydrocyacetone and 2-hydroxymalonaldehyde. *Journal of Agricultural and Food Chemistry* 29, 548-550.

RAGAB, D.M., BABIKER, E.E. & ELTINAY, A.H. 2004. Fractionation, solubility and functional properties of cowpea (*Vigna unguiculata*) proteins as affected by pH and/or salt concentration. *Food Chemistry* 84, 207-212.

RANGEL, A., DOMONT, G.B., PEDROSA, C. & FERREIRA, S.T. 2003. Functional properties of purified vicillins from cowpea (*Vigna unguiculata*) and pea (*Pisum sativum*) and cowpea protein isolate. *Journal of Agricultural and Food Chemistry* 51, 5792-5797.

RAO, M.A., OKECHUKWU, P.E., Da SILVA, P.M.S. & OLIVEIRA, J.C. 1997. Rheological behaviour of heated starch dispersions in excess water: role of starch granule. *Carbohydrate Polymers* 33, 273-283.

RIZZI, G. The Maillard reaction in Foods. In T.P. Labuza, G.A. Reineccius, V.M. Monnier, J. O'Brien, J.W. Baynes, Eds. *Maillard Reactions in Chemistry, Food, and Health*. Cambridge: The Royal Society of Chemistry, pp 11- 19.

ROCKLAND, L.B. & JONES, F.T. 1974. Scanning electron microscope studies on dry beans: Effects of cooking on the cellular structure of cotyledons in rehydrated large Lima beans. *Journal of Food Science* 39, 342-346.

ROMAN-GUTIERREZ, A.D., GUILBERT, S. & CUQ, B. 2002. Description of microstructural changes in wheat flour and flour components during hydration by using environmental scanning electron microscopy. *Lebensmittel-Wissenschaft und-Technologie* 35, 730-740.

ROMBO, G.O., TAYLOR, J.R.N. & MINNAAR, A. 2004. Irradiation of maize and bean flours: effects on starch physicochemical properties. *Journal of the Science of Food and Agriculture* 84, 350-356.

SAIO, K. & MONMA, M. 1993. Microstructural approach to legume seeds for food uses. *Food structure* 12, 333-341.

SARANTINOS, J. & BLACK, R. 1996. Effects of micronisation on the chemical and functional properties of chickpeas. *Food Australia* 48, 39-42.

SCHIEKE, S.M., SCHROEDER, P. & KRUTMANN, J. 2003. Cutaneous effects of infrared radiation: From clinical observations to molecular response mechanisms. *Photodermatology Photoimmunology & Photomedicine* 19, 228-234.

SEFA-DEDEH, S., STANLEY, D.W. & VOISEY, P.W. 1978. Effects of soaking time and cooking conditions on texture and microstructure of cowpeas (*Vigna unguiculata*). *Journal of Food Science* 43, 1832-1838.

SEFA-DEDEH, S. & STANLEY, D.W. 1979a. Textural implications of the microstructure of legumes. *Food Technology* 10, 77-83.

SEFA-DEDEH, S. & STANLEY, D.W. 1979b. The relationship of microstructure of cowpeas to water absorption and dehulling properties. *Cereal Chemistry* 56, 379-386.

SEFA-DEDEH, S. & STANLEY, D.W. 1979c. Cowpea proteins. 2. Characterisation of water extractable proteins. *Journal of Agricultural and Food Chemistry* 27, 1244-1247.

SEFA-DEDEH, S., STANLEY, D.W. & VOISEY, P.W. 1979. Effect of storage time and conditions on the hard to cook defect in cowpeas (*Vigna unguiculata*). *Journal of Food Science* 44, 790-796.

SERDAROGLU, M., YILDIZ-TURP, G. & ABRODIMOV, K. 2005. Quality of low-fat meatballs containing legume flours as extenders. *Meat Science* 70, 99-105.

SIMPSON, C.F. & WHITTAKER, M. 1983. *Electrophoretic techniques*. London: Academic Press, pp 24.

SINGH, H. 1991. Modification of food proteins by covalent crosslinking. *Trends in Food Science & Technology* 2, 196-200.

SINGH, B.B., AJEIGBE, H.A., EZEAKU, I. & MOHAMMAD, I.B. 2005. Improved cowpea based cropping systems for sustainable increase in food production and income generation in West Africa. *Proceedings of the 1st International Edible Legumes Conference in conjunction with the IVth World Cowpea Congress*.

SINGH, A., HUNG, Y-C., CORREDIG, M., PHILLIPS, R.D., CHINNAN M. & McWATTERS, K.H. 2005. Effect of milling method on selected physical and functional properties of cowpea (*Vigna unguiculata*) paste. *International Journal of Food Science and Technology* 40, 525-536.

SMITH, D.M. 1994. Protein separation and characterization procedures. In S.S. Nielsen (Ed) *Introduction to the Chemical Analysis of Foods*. London:Jones & Bartlett Publishers, pp 221-232.

SZCZESNIACK, A.S. 2002. Texture is a sensory property. *Food Quality and Preference* 13, 215-225.

TAIWO, K.A., AKANBI, C.T. & AJIBOLA, O.O. 1996. Thermal properties of ground and hydrated cowpea. *Journal of Food Engineering* 29, 249-256.

TAIWO, K.A., AKANBI, C.T. & AJIBOLA, O.O. 1997a. Establishing processing conditions for canning cowpea seeds in tomato sauce. *International Journal of Food Science and Technology* 32, 313-324.

TAIWO, K.A., AKANBI, C.T. & AJIBOLA, O.O. 1997b. Effect of soaking and cooking time on the cooking properties of two cowpea varieties. *Journal of Food Engineering* 33, 337-346.

TAIWO, K.A. 1998. The potential of cowpea as human food in Nigeria. *Technovation* 18, 469-481.

TAIWO, K.A., AKANBI, C.T. & AJIBOLA, O.O. 1998. Regression relationships for the soaking and cooking properties of two cowpea varieties. *Journal of Food Engineering* 37, 331-344.

TANANUWONG, K. & REID, D.S. 2004. DSC and NMR relaxation studies of starch-water interactions during gelatinization. *Carbohydrate polymers* 58, 345-358.

TAYLOR, J.R.N., NOVELLIE, L. & LIEBENBERG, N. 1984. Sorghum protein body composition and ultrastructure. *Cereal Chemistry* 61, 69-73.

THOMAS, D.J. & ARTWELL, W.A. 1999. *Starches*. St Paul: Eagan Press, pp 13-24.

TILLEY, K.A., BENJAMIN, R.E., BAGOROGOZA, K.E., OKOT-KOTBER, B.M., PRAKASH, O. & KWEN, H. 2001. Tyrosine cross links: Molecular basis of gluten structure and function. *Journal of Agricultural and Food Chemistry* 49, 2627-2632.

TOWNSEND, A. & NAKAI, S. 1983. Relationships between hydrophobicity and foaming characteristics of food proteins. *Journal of Food Science* 48, 588-594.

UKHUN, M.E. 1987. Browning phenomena in stored raw cowpea (*Vigna unguiculata*) flour. *Food Chemistry* 26, 23-29.

UWAEGBUTE, A.C., IROEGBU, C.U., & EKE, O. 2000. Chemical and sensory evaluation of germinated cowpeas (*Vigna unguiculata*) and their products. *Food Chemistry* 68, 141-146.

Van BUREN, J., BOURNE, M., DOWNING, D., QUELE, D., CHISE, E. & COMSTOCK, S. 1996. Processing factors influencing splitting and other quality characteristics of canned kidney beans. *Journal of Food Science* 51, 1228-1230.

Van den EINDE , R.M., van der GOOT, A.J. & BOOM, R.M. 2003. Understanding molecular weight reduction of starch during heating-shearing processes. *Journal of Food Science* 68, 2397-2404.

Van den EINDE , R.M., AKKERMANS, C., van der GOOT, A.J. & BOOM, R.M. 2004. Molecular breakdown of corn starch by thermal and mechanical effects. *Carbohydrate Polymers* 56, 415-422.

WANG, N., DAUN, J.K. & MALCOLMSON, L.J. 2003. Relationship between physicochemical and cooking properties, and effect of cooking on antinutrients, of yellow field peas (*Pisum sativum*). *Journal of the Science of Food and Agriculture* 83, 1228-1237.

WANG, Y., McALLISTER, T.A., ZOBELL, D.R., PICKARD, M.D., RODE, L.M., MIR, Z. & CHENG, K.J. 1998. The effect of micronization of full fat canola seed on digestion in the rumen and total tract of dairy cows. *Canadian Journal of Animal Science* 77, 431-439.

WHISTLER, R.L. & DANIEL, J.R. 1985. Carbohydrates. In O.R. Fennema (Ed), *Food Chemistry*. New York:Marcel Dekker, pp 98-99.

WU, X.J., JAMES, R. & ANDERSON, A.K. 2005. Mineral contents in seed coats and canning quality of selected cultivars of dark red kidney beans (*Phaseolus vulgaris* L.). *Journal of Food Processing and Preservation* 29, 63-74.

YU, L. & CHRISTIE, G. 2002. Measurement of starch thermal transitions using differential scanning calorimetry. *Carbohydrate Polymers* 46, 179-184.

ZARKADAS, L.N. & WISEMAN, J. 2001. Influence of processing variables during micronization of wheat on starch structure and subsequent performance and digestibility in weaned piglets fed wheat-based diets. *Animal Feed Science and Technology* 93, 93-107.

ZAYAS, J.F. 1997. *Functionality of protein in Food*. Berlin:Springer-Verlag, pp 1, 6-9, 76-81, 228-230.

ZHENG, G.H., FASINA, O., SOSULSKI, F.W. & TYLER, R.T. 1998. Nitrogen solubility of cereals and legumes subjected to micronization. *Journal of Agricultural and Food Chemistry* 46, 4150-4157.

ZHENG, G.H., HAN, H.L. & BHATTY, R.S. 1998. Physicochemical properties of zero amylose hull-less barley starch. *Cereal Chemistry* 75, 520-524.

ZHOU, Y., HOOVER, R. & LIU, Q. 2004. Relationship between α - amylase degradation and the structure and physicochemical properties of legume starches. *Carbohydrate Polymers* 57, 299-317.

PUBLICATIONS AND PRESENTATIONS

Peer reviewed publications

MWANGWELA, A.M., WANISKA, R.D. & MINNAAR, A. 2006. Hydrothermal treatments of two cowpea (*Vigna unguiculata* L. Walp) varieties: Effect of micronisation on physico-chemical and structural characteristics. *Journal of the Science of Food and Agriculture* 86, 35-45.

MWANGWELA, A.M., WANISKA, R.D., McDONOUGH C. & MINNAAR, A. 200X. Cowpeas cooking characteristics as affected by micronisation temperature: a study of the physicochemical and functional properties of starch. Accepted for publication in the *Journal of the Science of Food and Agriculture*.

MWANGWELA, A.M., WANISKA, R.D. & MINNAAR, A. 200X. Effect of micronisation temperature (130°C and 170°C) on functional properties of cowpea flour. Submitted to *Food Chemistry*.

Poster presentations

MWANGWELA, A.M., WANISKA, R.D., HALL, A. & MINNAAR, A. 2005. Effect of micronization temperature on structure and cooking characteristics of cowpea (*Vigna unguiculata* L. Walp) seeds. Poster presented at 1st International Edible Legume Conference and 4th World Cowpea Congress. Durban, South Africa. 17-21 April.

MWANGWELA, A.M., WANISKA, R.D., HALL, A. & MINNAAR, A. 2004. Structural changes during hydrothermal processing of cowpea seeds. Poster presented at the 43rd annual conference of the Microscopy Society of Southern Africa, Pretoria, South Africa, December.

ABU, J.O., BYARUHANGA, Y., EZEOUNGO, L; FOMBANG, E. MWANGWELA, A.M. 2004. What's cooking with the electromagnetic spectrum? Poster presented at the South African Association of Food Science and Technology (SAAFoST) Student's

Evening held at the Tshwane University of Technology, Pretoria, South Africa. September, 2004.

Conference papers and proceedings

MWANGWELA, A.M. & MINNAAR, A. 2006. East and Southern Africa regional planning meeting for the Bean/Cowpea CRSP, Maputo, Mozambique. 6-8, March.

MWANGWELA, A.M., WANISKA, R.D., PELEMBE, L. & MINNAAR, A. 2005. Value-added, processing and qualities of cowpea and bean-based foods. Conference on “Regional partnerships to enhance Bean/Cowpea consumption and production in Africa and Latin America”. Dakar, Senegal. 12-16, September.

MWANGWELA, A.M., WANISKA, R.D. & MINNAAR, A. 2005. The quest for convenient, dried, whole cowpeas: Use of micronisation to reduce the cooking time of cowpeas (*Vigna unguiculata* L. Walp). Trend-Spotting 2005: Fashion-Driven Food Science, an 18th South African Association of Food Science and Technology (SAAFoST) biennial international congress. Stellenbosch, South Africa. 5-8, September.

MWANGWELA, A.M., WANISKA, R.D., HALL, A. & MINNAAR, A. 2004. Structural changes during hydrothermal processing of cowpea seeds. Extended abstract published in the Proceedings the 43rd annual conference of the Microscopy Society of Southern Africa, Pretoria, South Africa.

Seminar presentations

MWANGWELA, A.M., WANISKA, R.D. & MINNAAR, A. The quest for convenient, dried, whole cowpeas: Use of micronisation to reduce the cooking time of cowpeas (*Vigna unguiculata* L. Walp). Presented to the inter-collegiate department of Food Science and Technology, Texas, A & M University, College Station, Texas. 1st April 2005.