

## 5. REFERENCES

Arnold, R.A., Noble, A.C. and Singleton, V.L., 1980. Bitterness and astringency of phenolic fractions in wine. *Journal of Agricultural and Food Chemistry* **28**, 675-678.

Asano, K., Shinagawa, K. and 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.

Asante, S.A., 1995. Sorghum quality and utilization. *African Crop Science Journal* **3**, 231-240.

Awika, J.M. and Rooney, L.W., 2004. Sorghum phytochemicals and their potential impact on human health. *Phytochemistry* **65**, 1199-1221.

Awika, J.M., McDonough, C.M. and Rooney L.W., 2005. Decorticating sorghum to concentrate healthy phytochemicals. *Journal of Agricultural and Food Chemistry* **53**, 6230-6234.

Awika, J.M., Rooney, L.W. and Waniska, R.D., 2004a. Anthocyanins from black sorghum and their antioxidant properties. *Food Chemistry* **90**, 293-301.

Awika, J.M., Rooney, L.W. and Waniska, R.D., 2004b. Properties of 3-deoxyanthocyanins from sorghum. *Journal of Agricultural and Food Chemistry* **52**, 4388-4394.

Awika, J.M., Dykes, L., Gu, L., Rooney, L.W. and Prior, R.L., 2003a. Processing of sorghum (*Sorghum bicolor*) and sorghum products alters procyanidin oligomers and polymer distribution and content. *Journal of Agricultural and Food Chemistry* **51**, 5516-5521.

Awika, J.M., Rooney, L.W., Wu, X., Prior, R. and Cisneros-Zevallos, L., 2003b. Screening methods to measure antioxidant activity of sorghum (*Sorghum bicolor*) and sorghum products. *Journal of Agricultural and Food Chemistry* **57**, 6657-6662.

Bartoshuk, L.M., 1993. The biological basis of food perception and acceptance. *Food Quality and Preference* **4**, 21-32.

Bartoshuk, L.M., Duffy, V.B. and Miller, I.J., 1994. PTC/PROP tasting: anatomy, psychophysics and sex effects. *Physiology Behavior* **56**, 1165-1171.

Bartoshuk, L.M., Fast, K., Karrer, T.A., Marino, S., Price, R.A. and Reed, D.A., 1992. PROP supertasters and the perception of sweetness and bitterness. *Chemical Senses Abstracts* **17**, 594.

Bate-Smith, E.C., 1973. Haemanalysis of tannins: the concept of relative astringency. *Phytochemistry* **12**, 907-912.

Beta, T., 2003. Anti-nutrients of anti-oxidants in cereal grains: an evaluation of the composition and functionality of phenolic compounds with special reference to sorghum and barley. <http://afripro.org.uk>, (accessed 26 November 2007).

Beta, T., Rooney, L.W. and Taylor, J.R.N., 2000. Effect of chemical conditioning on the milling of high-tannin sorghum. *Journal of the Science of Food and Agriculture* **80**, 2216-2222.

Beta, T., Rooney, L.W., Marovatsanga, L.T. and Taylor, J.R.N., 1999. Effect of chemical treatments on polyphenols and malt quality in sorghum. *Journal of Cereal Science* **31**, 295-302.

Blakeslee, A.F. and Fox, A.L., 1932. Our different taste worlds: PTC as a demonstration of genetic differences in taste. *Journal of Heredity* **23**, 97-107.

Block, G., Patterson, B. and Subar, A., 1992. Fruit, vegetables, and cancer prevention: a review of the epidemiological evidence. *Nutrition and Cancer* **18**, 1-29.

Bloom, K., Duizer, L.M. and Findlay, C.J., 1994. An objective numerical method of assessing the reliability of time intensity panellists. *Journal of Sensory Studies* **10**, 285-294.

Borgognone, M.G., Bussi, J. and Hough, G., 2001. Principal component analysis in sensory analysis: covariance or correlation matrix? *Food Quality and Preference* **12**, 323-326.

Boulton, R.B. and Noble, A.C., 1994. Physiological factors contributing to the variability of sensory assessments: relationship between salivary flow rate and temporal perception of gustatory stimuli. *Food Quality and Preference* **5**, 55-64.

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

Breslin, P.A.S., Gilmore, M.M., Beauchamp, G.K. and Green, B.G., 1993. Psychophysical evidence that oral astringency is a tactile sensation. *Chemical Senses* **18**, 405-417.

Brown, J.P., 1980. A review of the genetic effects of naturally occurring flavonoids, anthraquinones and related compounds. *Mutagenic Research* **75**, 243-277.

Bullard, R.W., Garrison, M.V., Kilburn, S.R. and York, J.O., 1980. Laboratory comparisons of polyphenols and their repellent characteristics in bird-resistant sorghum grains. *Journal of Agricultural and Food Chemistry* **28**, 1006-1011.

Butler, L.G., 1982. Polyphenols and their effect on sorghum quality. In: Rooney L.W. and Murty, D.S. (Eds.) *Proceedings of the International Symposium on Sorghum Grain Quality*. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru: India. pp. 294-311.

Butler, L.G., Riedl, D.J., Lebryk, D.G. and Blytt, H.J., 1984. Interaction of proteins with sorghum tannin: mechanism, specificity and significance. Presented at the AOCS Meeting, 11 May 1983. *JAOC* Vol. 61, no. 5. pp. 916-920.

Cheyrier, V., 2005. Polyphenols in foods are more complex than often thought. In Dietary Polyphenols and Health: Proceedings of the 1<sup>st</sup> International conference on polyphenols and health. *American Journal of Clinical Nutrition* **81**, 223S-229S.

Chibber, B.A.K., Mertz, E.T. and Axtell, J.D., 1978. Effects of dehulling on tannin content, protein distribution and quality of high and low tannin sorghum. *Journal of Agricultural and Food Chemistry* **26**, 679-683.

Chung, K.T., Wong, T.Y., Wei, C.I., Huang, Y.M., and Lin, Y., 1998. Tannins and human health; a review. *Critical Reviews in Food Science and Nutrition* **36**, 421-464.

Corrigan Thomas, T.C.J. and Lawless, H.T., 1995. Astringency sub-qualities in acids. *Chemical Senses* **20**, 593-600.

Cothren, J.T., Matocha, J.E. and Clark, L.E., 2000. Integrate crop management for sorghum. In: Wayne Smith, C. and Frederiksen R.A. (Eds.) *Sorghum: Origin, History, Technology and Production*. John Wiley & Sons, New York. pp. 409-410.

Courregelongue, S., Schlich, P., and Noble, A.N., 1999. Using repeated ingestion to determine the effect of sweetness, viscosity and oiliness of temporal perception of soymilk astringency. *Food Quality and Preference* **10**, 273-279.

Daiber, K.H., 1975. Enzyme inhibition by polyphenols of sorghum grain and malt. *Journal of the Science of Food and Agriculture* **26**, 1399-1411.

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

Delcour, J. Vandenberghe, M., Corten, P. and Dodeyne, P., 1984. Flavor thresholds of polyphenolics in water. *American Journal of Enology and Viticulture* **35**, 134-136.

Delwich, J.F., Buletic, Z. and Breslin, P.A.S., 2001. Covariation in individual's sensitivities to bitter compounds: evidence supporting multiple receptor/transduction mechanisms. *Perception and Psychophysics* **63**, 761-776.

Dicko, M.H., Hilhorst, R., Gruppen, H., Traore, A.S., Laane, C., Van Berkel, W.J.H. and Voragen, A.G.J., 2002. Comparison of content in phenolic compounds, polyphenol oxidase and peroxidase in grains of fifty sorghum varieties from Burkina Faso. *Journal of Agricultural and Food Chemistry* **50**, 3780-3788.

Dijksterhuis, G.B. and Piggott, J.R., 2001. Dynamic methods of sensory analysis. *Trends in Food Science and Technology* **11**, 284-290.

Dixon, R.A., Xie, D-Y. and Sharma, S.B., 2005. Proanthocyanidins – a final frontier in flavonoid research? *New Phytologist* **165**, 9-29.

Dlamini, N.R., Taylor, J.R.N. and Rooney, L.W., 2007. The effect of sorghum type and processing on the antioxidant properties of African sorghum-based foods. *Food Chemistry* **105**, 1412-1419.

Drewnowski, A., 2004. 6-n-propylthiouracil sensitivity, food choices and food consumption. In: Prescott, J. and Tepper, B. (Eds.) *Genetic Variation in Taste Sensitivity*. Marcel Dekker, New York. pp. 179-194.

Drewnowski, A. and Gomez-Carneros, C., 2000. Bitter taste, phytonutrients, and the consumer: a review. *American Journal of Clinical Nutrition* **72**, 1424-1435.

Drewnowski, A. and Rock, C.L., 1995. The influence of genetic taste markers on food acceptance. *American Journal of Clinical Nutrition* **62**, 506-511.

Drewnowski, A., Henderson, S.A. and Shore, A.B., 1997. Taste responses to naringin, a flavonoid, and the acceptance of grapefruit juice are related to genetic sensitivity to 6-n-propylthiouracil. *American Journal of Clinical Nutrition* **66**, 391-397.

Duffy, V.B., Miller, I.J. and Bartoshuk, L.M., 1994. 6-n-propylthiouracil (PROP) supertasters and women have greater number of fungiform papillae taste buds. *Chemical Senses* **19**, 465.

Duizer, L.M., Bloom, K. and Findlay, C.J., 1997. Dual-attribute time intensity sensory evaluation: a new method for temporal measurement of sensory perceptions. *Food Quality and Preference* **8**, 261-269.

Dykes, L. and Rooney, L.W., 2006. Sorghum and millet phenols and antioxidants (Review). *Journal of Cereal Science* **44**, 236-251.

Dykes, L. and Rooney, L.W., 2007. Phenolic compounds in cereal grains and their health benefits. *Cereal Foods World* **52**, 105-111.

Dykes, L., Rooney, L.W., Waniska, R.D. and Rooney, W.L., 2005. Phenolic compounds and antioxidant activity of sorghum grains of varying genotypes. *Journal of Agricultural and Food Chemistry* **53**, 6813-6818.

Dykes, L., Awika, J., McDonough, C.M., Rooney L.W. and Waniska, R.D., 2002. American Association of Cereal Chemists (AACC) abstracts:  
[www.aaccnet.org/meetings/2002/abstracts/a02ma286.asp](http://www.aaccnet.org/meetings/2002/abstracts/a02ma286.asp), (accessed 15 November 2006).

El Hag, M.E., El Tinay, A.H. and Yousif, N.E., 2002. Effect of fermentation on starch, total polyphenols, phytic acid content and in vivo digestibility of pearl millet. *Food Chemistry* **77**, 193-196.

Emmambux, N.M. and Taylor, J.R.N., 2003. Sorghum kafirin interaction with various phenolic compounds. *Journal of the Science of Food and Agriculture* **83**, 402-407.

Fischer, U., Boulton, R.B. and Noble, A.C., 1994. Physiological factors contributing to the variability of sensory assessments: relationship between salivary flow rate and temporal perception of gustatory stimuli. *Food Quality and Preference* **5**, 55-64.

Food and Agriculture Organization, FAOSTAT Agricultural Data 2006.

<http://faostat.fao.org/faostat>, (accessed 25 July 2006).

Fox, A.L., 1931. Six in ten 'tastebblind' to bitter chemical. *Science Newsletter* **9**, 249.

François, N., Guyot-Declerck, C., Hug, B., Callemien, D., Govaerts, B. and Collin, S., 2006. Beer astringency assessed by time intensity and quantitative descriptive analysis: Influence of pH and accelerated aging. *Food Quality and Preference* **17**, 445-452.

Frank, R.A. and Korchmar, D.L., 1985. Gustatory processing differences in PTC tasters and non tasters: a reaction time analysis. *Physiology and Behavior* **35**, 239-242.

Gawel, R., Iland, P.G., and Francis, I.L., 2001. Characterizing the astringency of red wine: a case study. *Food Quality and Preference* **12**, 83-94.

Gent, J.F. and Bartoshuk, L.M., 1983. Sweetness of sucrose, neohesperidin dihydrochalcone, and saccharin is related to genetic ability to taste the bitter substance 6-*n*-propylthiouracil. *Chemical Senses* **7**, 265-272.

Glendinning, J.L., 1994. Is the bitter rejection response always adaptive? *Physiology and Behavior* **56**, 1217-1227.

Goldman, I.L., Kadar, A.A. and Heintz, C., 1999. Influence of production, handling and storage on phytonutrient content of foods. *Nutrition Review* **9**, 546-552.

Gu, L., Kelm, M., Hammerstone, J.F., Beecher, G., Cunningham, D., Vannozzi, S. and Prior, R.L., 2002. Fractionation of Polymeric procyanidins from low bush blueberry and optimized Normal-phase HPL-MS fluorescent detection method. *Journal of Agricultural and Food Chemistry* **50**, 4852-4860.

Guinard, J.X., Pangborn, R.M. and Lewis, M.J., 1986a. The time-course of astringency in wine upon repeated ingestion. *American Journal of Enology and Viticulture* **37**, 184-189.

Guinard, J.X., Pangborn, R.M. and Lewis, M.J., 1986b. Preliminary studies on acidity-astringency interactions in model solutions and wines. *Journal of the Science of Food and Agriculture* **37**, 811-817.

Hagerman, A.E. and 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. and Butler, L.G., 1981. The specificity of proanthocyanidin-protein interactions. *Journal of Biological Chemistry* **256**, 4494-4497.

Hahn, D.H., Faubion, J.M. and Rooney, L.W., 1983. Sorghum phenolic acids, their high performance liquid chromatography separation and their relation to fungal resistance. *Cereal Chemistry* **60**, 255-259.

Hall, M.J., Bartoshuk, L.M., Cain, W.S. and Stevens, J.C., 1975. PTC taste blindness and the taste of caffeine. *Nature* **253**, 442-443.

Haslam, E. and Lilley, T.H., 1988. Natural astringency in food-stuffs - a molecular approach. *CRC Critical Reviews in Food Science and Nutrition* **27**, 1-40.

Heim, K.E., Taglieferro, A.R and Bobilya, D.J., 2002. Flavonoid antioxidants: chemistry, metabolism and structure-activity relationships. *Journal of Nutritional Biochemistry* **13**, 572-584.

Heinio, R.L., Liukkonen, K.H, Katina, K., Myllymaki, O. and Poutanen, K., 2003. Milling fractions of rye produces different sensory profiles of both flour and bread. *Lebensmittel Wissenschaft und Technologie* **36**, 577-583.

Herness, M.S. and Gilbertson, T.A., 1999. Cellular mechanisms of taste transduction. *Annual Reviews in Physiology* **61**, 873-900.

Hollman, P.C.H. and Katan, M.B., 1999. Dietary flavonoids: intake, health effects and bioavailability. *Food and Chemical Toxicology* **37**, 937-942.



Horne, J., Hayes, J. and Lawless, H.T., 2002. Turbidity as a measure of salivary protein reactions with astringent substance. *Chemical Senses* **27**, 653-659.

International Organization for Standardization (ISO), 1993. Sensory analysis – guidelines for selection, training and monitoring of assessors – Part 1: Selected assessors (ISO 8586), Geneva: Switzerland.

Ishikawa, T. and Noble, A.C., 1995. Temporal perception of astringency and sweetness in red wine. *Food Quality and Preference* **6**, 27-33.

Joslyn, M.A. and Goldstein, J.L., 1964. Astringency in fruits and fruit products in relation to phenolic content. *Advances in Food Research* **13**, 179-217.

Kallithraka, S., Bakker, J. and Clifford, M.N., 1997a. Red wine and model wine astringency as affected by malic acid and lactic acid. *Journal of Food Science* **62**, 416-420.

Kallithraka, S., Bakker, J. and Clifford, M.N., 1997b. Effect of pH on astringency in model solutions and wines. *Journal of Agricultural and Food Chemistry* **45**, 2211-2216.

Kallithraka, S., Bakker, J. and Clifford, M.N., 1997c. Evaluation of bitterness and astringency of (+)-catechin and (-)-epicatechin in red wine and in model solutions. *Journal of Sensory Studies* **12**, 25-37.

Kallithraka, S., Bakker, J., Clifford, M.N. and Vallis, L., 2001. Correlations between saliva protein composition and some TI parameters of astringency. *Food Quality and Preference* **12**, 145-152.

Kalmus, H., 1958. Improvements in the classification of the taster genotypes. *Annals of Human Genetics* **22**, 222-230.

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

Kamatha, V. G., Chandrashekarb, A. and Rajinia, P.S., 2004. Antiradical properties of sorghum (*Sorghum bicolor* L. Moench) flour extracts. *Journal of Cereal Science* **40**, 283–288.

Kaminski, L.C., Henderson, S.A. and Drewnowski, A., 2000. Young women's food preferences and taste responsiveness to 6-n-propylthiouracil (PROP). *Physiology and Behavior* **68**, 691-697.

Keast, R.S.J. and Breslin, P.A.S., 2002. Cross-adaptation and bitterness inhibition of L-tryptophan, L-phenylalanine and urea: further support for shared peripheral physiology. *Chemical Senses* **27**, 123-131.

Kebakile, M.M., Rooney, L.W. and Talyor, J.R.N., 2007. Effects of hand pounding, abrasive decortication-hammer milling, roller milling and sorghum type on meal extraction and quality. *Cereal Foods World* **52**, 129-137.

Keller, K.L., Steinmann, L., Nurse, R.J. and Tepper, B.J., 2002. Genetic sensitivity to 6-n-propylthiouracil influences food preference and reported intake in preschool children. *Appetite* **38**, 3-12.

Kennedy, R., 2000. Grape seed tannins: impact on red wine. *Practical winery and vineyard (PWV)*. [www.practicalwinery.com](http://www.practicalwinery.com), (accessed 4 June 2007).

Kennedy, J.A., Saucier, C. and Glories, Y., 2006. Grape and wine phenolics: history and perspective. *American Journal of Enology and Viticulture* **57**, 239-248

Kielhorn, S. and Thorngate III, J.H., 1999. Oral sensations associated with the flavan-3-ols (+)-catechin and (-)-epicatechin. *Food Quality and Preference* **10**, 109-116.

Kim, U.K., Breslin, P.A.S., Reed, D. and Drayna, D., 2004. Genetics of taste perception. *Journal of Dental Research* **83**, 448-453.

King, B.M. and Duineveld, C.A.A., 1999. Changes in bitterness as beer ages naturally. *Food Quality and Preference* **10**, 315-324.

Kinnamon, S.C., 1996. Taste transduction: linkage between molecular mechanisms and psychophysics. *Food Quality and Preference* **7**, 153-159.

Krishnaswamy, K. and Polasa, K., 2001. Nonnutrients and cancer prevention. In: Medappa, N. and Srivastava (Eds.) *Indian Council of Medical Research (ICMR) Bulletin* vol. 31, No. 1. Hyderabad: ICMR, pp. 1-9.

Lagerlof, F. and Dawes, C., 1985. Effect of sucrose as a gustatory stimulus on the flow rates of parotid and whole saliva. *Caries Research* **19**, 206-211.

Lakshmi, K.B. and Vimala, V., 1996. Hypoglycemic effect of selected sorghum recipes. *Nutrition Research* **16**, 1651-1658.

Lawless, H.T., and Heymann, H., 1998. *Sensory Evaluation of Food: Principles and Practices*. Aspen Publishers, Gaithersburg: MD. pp. 39-49, 61-67, 97-99, 265-296.

Lea, A.G. and Arnold, G.M., 1978. The phenolics of cider. Bitterness and astringency. *Journal of the Science of Food and Agriculture* **29**, 478-483.

Lea, A.G. and Timberlake, C.F., 1974. The phenolics of ciders: procyanidins. *Journal of the Science of Food and Agriculture* **25**, 1537-1545.

Leach, E.J., 1984. Evaluation of astringency and bitterness by scalar and time intensity procedures. PhD Thesis. University of California. Davis: CA.

Leach, E.J. and Noble, A.C., 1986. Comparison of bitterness of caffeine and quinine by a time intensity procedure. *Chemical Senses* **11**, 339-345.

Lee, C.B. and Lawless, H.T., 1991. Time-course of astringency sensations. *Chemical Senses* **16**, 225-238.

Lesschaeve, I., and Noble, A.C., 2005. Polyphenols: factors influencing their sensory properties and their effects on food and beverage preferences. *American Journal of Clinical Nutrition*, **81** (suppl), 330S-335S.

Lewis-Beck, M.S., 1993. Applied regression: an introduction. In: Lewis-Beck, M.S. (Ed.) *Regression Analysis*. SAGE Publications Toppan Publishing, London. pp. 1-66.

Li, Y. and Trush, M.A., 1994. Reactive oxygen-dependent DNA damage resulting from the oxidation of phenolic compounds by a copper-redox cycle mechanism. *Cancer Research* **54**, 1895S-1898S.

Loomis, W.D. and Battaile, J., 1966. Plant phenolic compounds and the isolation of plant enzymes. *Phytochemistry* **5**, 423-438.

Lule, S.U. and Xia, W., 2005. Food phenolics, pros and cons: a review. *Food Reviews International* **21**, 367-388.

Lyman, B.J. and Green, B.G., 1990. Oral astringency: effects of repeated exposure and interactions with sweeteners. *Chemical Senses* **15**, 151-164.

Mamary, M., Habori, M., Aghbari, A. and Obeidi, A., 2001. *In vivo* effects of dietary sorghum tannins on rabbit digestive enzymes and mineral absorption. *Nutrition Research* **21**, 1393-1401.

Marino, S., Bartoshuk, L.M., Monaco, J., Anliker, J.A., Reed, D. and Desnoyers, S., 1991. PTC/PROP and the tastes of milk products. *Chemical Senses Abstracts* **16**, 551.

Mattes, R.D., 1994. Influences on acceptance of bitter foods and beverages. *Physiology and Behavior* **56**, 1229-1236.

Mateus, N., Pinto, R., Ruao, P. and De Freitas, V., 2004. Influence of the addition of grape seed procyanidins to port wines in the resulting reactivity with human salivary proteins. *Food Chemistry* **84**, 195-200.

McGowan, B.A. and Lee, S.Y., 2006. Comparison of methods to analyze time intensity curves in a corn zein chewing gum study. *Food Quality and Preference* **17**, 296-306.

McLaughlin, S.K. and Margolskee, R., 1994. The sense of taste. *American Scientist* **82**, 538.

McManus, J.P., Davis, K.G., Lilley, T.H. and Haslam, E., 1981. The association of proteins with polyphenols. *Journal of the Chemical Society. Chemical Communication* **24**, 309-311.

Mehansho, H., Clements, S., Sheares, B.T., Smith, S. and Carlson, D.M., 1985. Induction of proline-rich glycoprotein synthesis in mouse salivary glands by isoproterenol and by tannins. *Journal of Biological Chemistry* **260**, 4418-4423.

Mehansho, H., Hagerman, A., Clements, S., Butler, L.G., Rogler, J. and Carlson, D.M., 1983. Modulation of proline-rich protein biosynthesis in rat parotid glands by sorghums with high tannin levels. *Proceedings of the National Academy of Sciences, USA* **80**, 3948-3952.

Mela, D.J., 1989. Bitter taste intensity: the effect of tastant and thiourea taster status. *Chemical Senses* **14**, 131-135.

Miller, I.J. and Reedy, F.E., 1990a. Quantification of fungiform papillae and taste pores in living subjects. *Chemical Senses* **15**, 281-294.

Miller, I.J. and Reedy, F.E., 1990b. Variations in human taste bud density and taste intensity perception. *Physiology and Behavior* **47**, 1213-1219.

Muenzer, J., Bildstein, C., Gleason, M. and Carlson, D.M., 1979. Properties of proline-rich proteins from parotid glands of isoproterenol-treated rats. *Journal of Biological Chemistry* **254**, 5629-5634.

Mugula, J.K. and Lyimo, M., 2000. Evaluation of the nutritional quality and acceptability of sorghum-based tempe as potential weaning foods in Tanzania. *International Journal of Food Sciences and Nutrition* **51**, 269-277.

Murty, D.S. and 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.

Naczki, M. and Shahidi, F., 2004. Extraction and analysis of phenolics in food. *Journal of Chromatography A* **1054**, 95-111.

Naurato, N., Wong, P., Lu, Y., Wromblewski, K. and Bennick, A., 1999. Interaction of tannin with salivary histatins. *Journal of Agricultural and Food Chemistry* **47**, 2229-2234.

Ness, A.R. and Powles, J.W., 1997. Fruit and vegetables, and cardiovascular disease: A review. *International Journal of Epidemiology* **26**, 1-13.

Noble, A.C., 1995. Application of time-intensity procedures for evaluation of taste and mouth-feel. *American Journal of Enology and Viticulture* **46**, 128-133.

Noble, A.J., Matysiak, N.L. and Bonnans, S., 1991. Factors affecting time-intensity parameters of sweetness. *Food Technology* **45**, 121-126.

Olson, J.M., Boehnke, M., Neiswanger, K., Roche, A.F. and Siervogel, R.M., 1989. Alternative genetic models for the inheritance of the phenylthiocarbamide taste deficiency. *Genetic Epidemiology* **6**, 423-434.

Pangborn, R.M., Lewis, M.J. and Yamashita, J.F., 1983. Comparison of time intensity with category scaling of bitterness of iso-alpha-acids in model systems and in beer. *Journal of the Institute of Brewing* **83**, 349-355.

Peleg, H. and Noble, A.C., 1995. Perceptual properties of benzoic acid derivatives. *Chemical Senses* **20**, 393-400.

Peleg, H. and Noble, A.C., 1999. Effect of viscosity, temperature and pH on astringency in cranberry juice. *Food Quality and Preference* **10**, 343-37.

Peleg, H., Bodine, K.K. and Noble, A.C., 1998. The influence of acid on astringency of alum and phenolic compounds. *Chemical Senses* **23**, 371-378.

Peleg, H., Gacon, K., Schilch, P. and Noble, A.C., 1999. Bitterness and astringency of flavan-3-ol monomers, dimers and trimers. *Journal of the Science of Food and Agriculture* **79**, 1123-1128.

Peryam, D.R. and Pilgrim, F.J., 1957. Hedonic scale method of measuring food preferences. *Food Technology* (Sep. 1957), 9-14.

Peyvieux, C. and Dijksterhuis, G., 2001. Training a sensory panel for T-I: a case study. *Food Quality and Preference* **12**, 19-28.

Pickering, G.J., Simunkova, K. and DiBattista, D., 2003. Intensity of taste and astringency sensations elicited by red wines is associated with sensitivity to PROP (6-n-propylthiouracil). *Food Quality and Preference* **15**, 147-154.

Porter, L.J., 1992. Structure and chemical properties of the condensed tannins. In: Hemingway, R.W. and Laks, P.E. (Ed.) *Plant Polyphenols*. Plenum Press, New York. pp. 245-257.

Price, M.L. and Butler, L.G., 1977. Rapid visual estimation and spectrophotometric determination of tannin content of sorghum grain. *Journal of Agricultural and Food Chemistry* **25**, 1268-1273.

Price, M.L., Van Scoyoc, S. and Butler, L.G., 1978. A critical evaluation of the vanillin reaction as an assay for tannin in sorghum grain. *Journal of Agricultural and Food Chemistry* **26**, 1214-1218.

Ragae, S., Abdel-Aal, E-S.M. and Noaman, M., 2006. Antioxidant activity and nutrient composition of selected cereals for food use. *Food Chemistry* **98**, 32-38.

Reed, D.R., Tanaka, T. and McDaniel, A.H., 2006. Diverse tastes: genetics of sweet and bitter perception. *Physiology and Behavior* **88**, 215-226.

Reichert, R.D., Youngs, C.G. and Oomah, B.D., 1982. Measurement of grain hardness and dehulling quality with a multisample tangential abrasive decortication device (TADD). In: Rooney L.W. and Murty, D.S., (Eds.) *Proceedings of the International Symposium on Sorghum Grain Quality*. ICRISAT, Patancheru: India. Pp. 186-193.

Rodgers, S., Busch, J., Peters, H. and Christ-Hazelhof, E., 2005. Building a tree of knowledge: analysis of bitter molecules. *Chemical Senses* **30**, 547-557.

Rooney, L.W. and Miller, F.R., 1982. Variation in the structure and kernel characteristics of sorghum. In: Rooney, L.W. and Murty, D.S. (Eds.) *Proceedings of the International Symposium on Sorghum Grain Quality*. ICRISAT, Patancheru: India. pp. 143-162.

Ross, J.A. and Kasum, C.M., 2002. Dietary flavonoids: bioavailability, metabolic effects and safety. *Annual Review of Nutrition* **22**, 19-34.

Rubico, S.M. and McDaniel, M.R., 1992. Sensory evaluation of acids by free-choice profiling. *Chemical Senses* **17**, 273-289.

Siebert, K.J., 1999. Effects of protein-polyphenol interactions on beverage haze, stabilization and analysis. *Journal of Agricultural and Food Chemistry* **47**, 353-361.

Siebert, K.J. and Chassy, A.W., 2003. An alternate mechanism for the astringency sensation of acids. *Food Quality and Preference* **15**, 13-18.



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

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

Simon, C., Barathieu, K., Laguerre, M., Schmitter, J-M., Fouquet, E., Pianet, I. and Dufourc, E.J., 2003. Three-dimensional structure and dynamics of wine tannin-saliva complexes. A multitechnique approach. *Biochemistry* **42**, 10385-10395.

Smith, A.K., June, H. and Noble, A.C., 1996. Effects of viscosity on bitterness and astringency of grape seed tannin. *Food Quality and Preference* **7**, 161-166.

Souquet, J-M, Cheynier, V., Brossaud, F. and Moutounet, M., 1996. Polymeric proanthocyanidins from grape skins. *Phytochemistry* **43**, 509-512.

Stein, L.J., Nagai, H., Nakagawa, M., and Beauchamp, G.K., 2003. Effects of repeated exposure and health-related information on hedonic evaluation and acceptance of a bitter beverage. *Appetite* **40**, 119-129.

Steinmetz, K.A. and Potter, J.D., 1996. Vegetables, fruits and cancer: A review. *Journal of the American Dietetic Association* **96**, 1027-1039.

Strumeyer, D.H. and Malin, M.J., 1975. Condensed tannins in grain sorghum: isolation, fractionation and characterization. *Journal of Agricultural and Food Chemistry* **23**, 909-914.

Subramanian, V., Murty, D.S., Jambunathan, R. and House, L.R., 1982. Boiled sorghum characteristics and their relationship to starch properties. In: Rooney, L.W. and Murty, D.S. (Ed.) *Proceedings of the International Symposium on Sorghum Grain Quality*. ICRISAT, Patancheru: India. pp. 103-109.

Swaim, T. and Bate-Smith, E.C., 1962. Flavonoid compounds. In: Florkin, M. and Mason, H.S. (Eds.) *Comparative Biochemistry, a Comprehensive Treaty*, Vol. III: Constituents of life – part A. Academic Press, New York. pp. 755-809.

Taylor, J.R.N., 2001. Methods to be used to identify and specify characteristics desired by industrial processors that use sorghum as an input, Technical Report #2. Task Order No. 4.1. USAID (United States of America Agency for International Development), Gaborone: Botswana.

Taylor, J.R.N., 2003. Overview: importance of sorghum in Africa. . <http://afripro.org.uk>, (accessed 26 November 2007).

Taylor, J.R.N., Von Benecke, R. and Carlsson, F.H.H., 1989. Distribution, purification and N-terminal amino acid sequence of sorghum reduced soluble protein. *Journal of Cereal Science* **9**, 169-177.

Tepper, B.J., 1998. Genetics of Perception '98 6-n-propylthiouracil: a genetic marker for taste with implications for food preference and dietary habits. *American Journal of Human Genetics* **63**, 1271-1276.

Tepper, B.J., 1999. Does genetic taste sensitivity to PROP influence food preferences and body weight? *Appetite* **32**, 422.

Tepper, B.J., Christensen, C.M., and Cao, J., 2001. Development of brief methods to classify individuals by PROP taster status. *Physiology and Behavior* **73**, 571-577.

Thorngate, J.H. and Noble, A.C., 1995. Sensory evaluation of bitterness and astringency of 3R (-)-epicatechin and 3S (+)-catechin. *Journal of the Science of Food and Agriculture* **67**, 531-535.

Tomic, O., Nilsen, A., Martens, M. and Næs, T., 2007. Visualization of sensory profiling data for performance monitoring. *Lebensmittel Wissenschaft und Technologie* **40**, 262-269.

Towo, E., Matuschek, E. and Svanberg, U., 2006. Fermentation and enzyme treatment of tannin sorghum gruels: effects on phenolic compounds, phytate and in vitro accessible iron. *Food Chemistry* **94**, 369-376.

Valentová, H., Skrovánková, S., Panovská, Z. and Pokorný, J., 2002. Time intensity studies of astringency taste. *Food Chemistry* **78**, 29-37.

Van Doorn, H.E., Van der Kruk, G.C., Van Holst, G-J, Raaijmakers-Ruijs, N.C.M.E., Postma, E., Groenweg, B. and Jongen, W.H.F., 1998. The glucosinolates siringin and progoitrin are important determinants for taste preference and bitterness of Brussels sprouts. *Journal of the Science of Food and Agriculture* **78**, 30-38.

Vidal, S., Francis, L., Noble, A., Kwiatkowski, M., Cheynier, V. and Waters, E., 2004. Taste and mouth-feel properties of different types of tannin-like polyphenolic compounds and anthocyanins in wine. *Analytica Chimica Acta* **513**, 57-65.

Vidal, S., Francis, L., Guyot, S., Marnet, N., Kwiatkowski, M., Gawel, R., Cheynier, V. and Waters, E.J., 2003. The mouth-feel properties of grape and apples proanthocyanidins in a wine-like medium. *Journal of the Science of Food and Agriculture* **83**, 564-573.

Vinson, J.A. and Dabbagh, Y.A., 1998. Tea phenols: antioxidant effectiveness of teas, tea components, tea fractions and their binding with lipoproteins. *Nutrition Research* **18**, 1067-1075.

Waterman, P.G. and Mole, S., 1994. *Analysis of Phenolic Plant Metabolites Extraction and Chemical Quantification*. Blackwell Scientific Publications, Oxford. pp. 66-104.

Yackinous, C.A. and Guinard, J-X, 2002. Relationship between PROP (6-n-propylthiouracil) taster status, taste anatomy and dietary intake measures for young men and women. *Appetite* **38**, 201-209.

Yamanishi, T., 1990. Bitter compounds in tea. In: Rouseff R.L. (Ed.) *Bitterness in Foods and beverages: Developments in Food Science* 25. Elsevier, Amsterdam. pp. 160-167.

Yetneberk, S., De Kock, H.L., Rooney, L.W. and Taylor, J.R.N., 2004. Effects of sorghum cultivar on injera quality. *Cereal Chemistry* **81**, 314-321.

Yetneberk, S., Rooney, L.W. and Taylor, J.R.N., 2005. Improving the quality of sorghum injera by decortication and compositing with tef. *Journal of the Science of Food and Agriculture* **85**, 1252-1258.

Yokomukai, Y., Cowart, B.J. and Beauchamp, G.K., 1993. Individual differences in sensitivity to bitter-tasting substances. *Chemical Senses* **18**, 669-681.

Youssef, A.M.M., Bolling, H., Moustafa, E.K. and Moharram, Y.G., 1988. Extraction, determination and fractionation of sorghum polyphenols. *Food Chemistry* **30**, 103-111.

Yu, J., Ahmedna, M. and Goktepe, I., 2005. Effects of processing methods and extraction solvents on concentration and antioxidant activity of peanut skin phenolics. *Food Chemistry* **90**, 199-206.

Zhao, L., Kirkmeyer, S.V. and Tepper, B.J., 2003. A paper screening test to assess genetic taste sensitivity to 6-*n*-propylthiouracil. *Physiology and Behavior* **78**, 625-633.

Zielinski, H. and Kozłowska, H., 2000. Antioxidant activity and total phenolics in selected cereal grains and their different morphological fractions. *Journal of Agricultural and Food Chemistry* **48**, 2008-2016.

Zimoch, J. and Findlay, C.J., 1998. Effective discrimination of meat tenderness using dual attributes time intensity. *Journal of Food Science* **63**, 940-944.

## 6. APPENDIX

Kobue-Lekalake, RI, Taylor, JRN, de Kock, HL. 2007. Effects of phenolics in sorghum grain on its bitterness, astringency and other sensory properties. *Journal of the Science Food and Agriculture* **87**, 1940-1948.

Kobue-Lekalake, RI, Taylor, JRN, de Kock, HL. 2007. Effects of tannins on sensory properties and acceptability of sorghums. 12<sup>th</sup> SAAFoST conference, Durban South Africa.