Poster exhibition parallel session 8: Microbial and chemical spoilage

PE8.01 Phyto-nutrients improve the quality of value added meat products. 5.00

Abdul S Babji (1) daging@ukm.my, CK Wei(1), N Abdullah (1)
(1)School of Chemical Science & Food Technology, Faculty Science & Technology, Malaysia

Malaysia being a tropical country enjoys the privilege of abundant rain forests, rich in phytochemicals. Over a short period of ten years, scientists in Asia have explored the active components in plants that exhibited antioxidative, antimicrobial, anti-inflammatory, and anti-cancer properties. It has long been known that herbs and spices possessed anti-oxidative property and since ancient time those plant chemicals have been used to prolong shelf-life and improve taste of meat products (Mielnik et al., 2003).

In the early nineties, KALSEC, a seasoning house in the United States produced commonly used spices with antioxidant activity (KALSEC, 1994). With serious product specifications such as standardization, product form and flavor compability, many seasonings were developed encompassing extracts with superior properties of providing consistent flavor, aroma as well as antioxidant activity. Currently, a number spices producers like Mac Cormick and KALSEC produced rosemary, sage, thyme, oregano, peppermint, mace, nutmeg, and turmeric, amongst others to spice up a whole variety of meals/dishes such as roasted chicken, marinated chicken parts and pizza toppings of salami, pastrami and bologna.

Scientists in Asia have been exploring the active components in plants for antioxidative, antimicrobial, anti-inflammatory, and anti-cancer properties. It has long been known that herbs and spices possessed anti-oxidative property and since ancient time those plant chemicals have been used to prolong shelf-life and improve taste of meat products (Mielnik, et al., 2003). Several studies had been conducted to evaluate the correlation between phenolic compounds and antioxidant activity. The antioxidant activity of Du-Zhong (*Eucomnia ulmoides*) (Yen and Hsieh, 1998), mung bean hulls (Duh et al., 1997), ear mushrooms (Chao, 2001) and anise seed (*Pimpenella anisum* L.) (Gülcin, et al., 2003) were found to correlate with the phenolic compounds. Studies on local plant such as turmeric (*Gurcuma domestica*), betel leaf (*Piper betel*), pandan leaf (*Panadanus odorus*), asam gelugur (*Garnicia atroviridis*), mengkudu (*Morinda citrifolia*), pegaga (*Centella asiatica*), ginger (*Zingiber officinale*), cassava shoot (*Manihot asculenta*) (Jayamalar and Suhaila, 1998; Mohd. Zin et al., 2002, Zainol et al., 2003; Noriham et al., 2004a) also exhibited good antioxidant activities. Wang et al. (1999) reported that the antioxidative properties of some vegetables and fruits are partly due to the low molecular weight phenolic compounds, which are known to be potent as an antioxidant.

In Malaysia, herb is commonly eaten fresh as a vegetable (salad and ulam), especially among the Malay communities. Most of these herbs are believed to be associated with antioxidant activities and have many beneficial effects. A small group of scientists in Universiti Kebangsaan Malaysia explored the effectiveness and beneficial functional and dietary contributions of selected plants in food systems such as minced meat, burgers, hot dogs, sausages and chicken balls.

A study by Rumaizah et al. (2005) investigated the effectiveness of three types of local plants ethanolic extracts, Indian pennywort (*Centella asiatica L.),* bitter gourd (*Momordica charantia L.)* and lemon grass (*Cymbopogon citrates*) to act as antioxidants in minced spent hen meat. All tested extracts were found to have lower thiobarbituric acid (TBARS) values ($P<0.05$) regardless the storage duration. This study suggested that Indian Pennywort, bitter gourd and lemon grass ethanolic extracts might be potential dietary antioxidants to replace synthetic antioxidants in food system such as minced spent hen meat. In another study by Noriham et al. (2005), water extracts of two local herbs were tested against lipid oxidation in mechanically deboned chicken meat (MDCM) sausages during storage at -18˚C for 6

months. The antioxidative activities were compared to the formulation without plant extracts, with standard synthetic antioxidant BHA/BHT, and commercial natural antioxidant rosemary oleoresin Herbalox^{R}. Formulations with plant extracts, BHA/BHT and rosemary oleoresin Herbalox^{R} showed significantly lower TBARS and peroxide values (PV) compared to control ($P<0.05$). Kesum extract showed the highest antioxidant activity and was comparable to the synthetic antioxidant, BHA/BHT. Extracts obtained from *Tamarindus indica* (tamarind), *Allium sativum* (garlic), *Apium graveolens* (celery) and *Curcuma domestica* (turmeric) were evaluated for the antioxidative effects in delaying lipid oxidation and rancidity in chicken ball during chill storage (4˚C) for 10 days. TBA and PV tests showed that natural antioxidants (plant extracts) were more effective in delaying lipid oxidation and rancidity in chicken ball, where the values of TBA and PV tests for natural antioxidants were much lower ($P<0.05$) that the control and BHA-BHT combination. Besides acting as antioxidants, these plants extracts also showed antimicrobial potential in the product. Curry paste and powder are the common food additives in Malaysian culinary. Chan & Babji (2006a & b) reported that water extracts from clove and cinnamon that are commonly found in Malaysian curry formulation, exhibited powerful antioxidant activity which is similar to ascorbic acid and combination of BHA/BHT (50%/50%) in chicken meatball emulsion, even though at the same level of concentration (200 ppm).

Natural antioxidants from local Malaysian herbs and vegetables may have more consumer appeal as those plants are accepted as healthy and safe for consumption. The recent revival of consumer interest in the therapeutic properties of herbs has led to an increase in consumer demand for herbal–based food products. Preliminary studies of screening potential herbs and spices were conducted by Huda-Faujan et al. (2007), Noriham et al. (2005) and Noriham et al. (2004b). Antioxidative activities (AOA), induction period (IP) used to measure the time of resistance towards oxidation, and phenolic compounds were evaluated on 11 plant extracts consisting of asam gelugor (*Garcinia atroviridus*), garlic (*Allium sativum*), belimbing buluh (*Averrhoe belimbi*), curry leaf (*Murraya koenigii*), turmeric leaf (*Curcuma domestica*), Indonesian bay leaf (*Eugena cumini*), musk lime (*Citrus micocaspa),* mango (*Mangifera indica*), Indian pennywort (*Centella asiatica*), lemon grass (*Cymbopogon citratus*) and ulam raja (*Cosmos caudatus*). All the plant extracts exhibited AOA. *G. atroviridus*, *A. sativum*, *A. belimbi, M. koenigii, C. micocaspa, M. indica, C. asiatica* and *C. citratus* have better AOA than BHT and vitamin C at 200 ppm. *G. atroviridus, A. sativum, A. belimbi, M. koenigii, C. domestica, E. Cumini, M. Indica, C. Asiatica,* and *C. Caudatus* have equal or better IP values than control treatment. Combining BHT with *M. indica* and *A. sativum* extracts at 100 ppm resulted in a synergistic increase of IP values. The plant extracts had phenolic compounds in the range of 0.1-2.39 mg/kg. Locally resourced natural antioxidants may facilitate towards the formulations of safer alternatives of antioxidants in food systems.

Screening trial of locally grown and consumed herbs and vegetables was conducted by Babji et al. (2005), to determine the total phenolic compound, which relate positively to antioxidant capacity. These plants include ulam raja (*Cosmos caudatus*), kesum (*Polygonum minus*), tenggek burung (*Melicope lunu-ankenda*), mint leaves (*Mentha arvensis*), kaffir leaves (*Citrus hystrix*), ginger (*Zingiber officinale*), mengkudu shoot (*Morinda citrifolia*), lemon grass (*Cymbopogon citratus*), cassava shoot (*Manihot esculenta*) and four angled bean (*Psohorcarpus tetragonolobus*). Results indicated high phenolic contents in most plant materials screened, each exhibiting different contents in different solvents such as methanol, ethanol, acetone and water. All these studies did show that certain plant materials do exhibit more antioxidative properties than others. The next interesting thing to do with the scientific knowledge that were obtained was to actually introduce calculated safe dosage of plant extracts in the form of paste, marinades and seasonings in meat based food system.

Marinating is an excellent way to turn less value meat cuts into succulent food products. Marinating not only adds value to cheaper cuts, but also creates new products with specific taste profiles. Turmeric rhizome have been reported to exhibit antioxidative activity, while lemon grass have been noted to exhibit antimicrobial effect in the marinated

meat and roast chicken. Moreover, addition of turmeric and lemon grass and their combination in marinades also resulted in improving consumer acceptance of the roasted spent hen breast meat. Traditional meat products are commonly associated with high fats and cholesterol. So it is only prudent for meat producers to offer less cholesterol/ less fats processed meats to the consumer. Babji et al. (2001) indicated that addition of red palm fat and palm oil resulted in chicken bologna with better sensory properties. Chicken burgers that were treated with palm fat and red palm fat had higher content of antioxidants, alpha, gamma and delta tocotrienol and had better shelf life quality compared to burgers formulated with chicken fat (Wan Rosli et al., 2004; Wan Rosli et al., 2003). It is envisaged that the use of phytochemicals in meat based products will be an interesting area for the meat industry to explore as these functional extracts with antioxidative and antimicrobial properties are able to replace the current usage of synthetic food additives in the development and improvement of healthy food products.

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