

stigmas production.

It was concluded that in order to trigger saffron flowering, it is necessary that a particular combination of temperature and soil water content

occurs, though this is still not yet fully understood. Colder environments enhance flower number, but determine a reduction in the amount of picrocrocin and crocetin esters and consequently lower stigmas

quality [Gresta F, Avola G, Lombardo GM, Siracusa L and Ruberto G, Analysis of flowering, stigmas yield and qualitative traits of saffron (*Crocus sativus* L.) as affected by environmental conditions, *Scient Horticult*, 2009, **119** (3), 320-324].

## Therapeutics

### Biomolecular constituents and antibacterial activity of some marine algae from Chilika Lake

The researchers at Orissa collected four marine algae from saline waters of Chilika Lake and screened for their antibacterial activity and biomolecular constituents. *In vitro* antibacterial activity was tested against three gram positive and four gram negative bacteria. Maximum activity (23 mm) was observed in the aqueous extracts of *Chaetomorpha* sp. against *Bacillus subtilis* and variable antibacterial activity

(19 mm and 14 mm) was observed in *Phormidium* sp. against *Bacillus subtilis* and *Escherichia coli*, respectively. All other species did not show any antibacterial activity against the test pathogens. All of these marine algae showed great variation in biochemical constituents such as carbohydrates, lipids, proteins, total chlorophyll, proline, amino acid, ascorbic acid and in phytochemicals like alkaloids, terpenoids, flavonoids,

cardiac glycosides, anthroquinone glycosides, saponins, phlobatanin, gums and mucilages, and phenols. Their pharmacological activities and bioactive constituents can be highly exploited [Patra JK, Patra AP, Mahapatra NK, Das S, Thatoi H, Sahu RK and Swain Gaurang Charan, Biomolecular constituents and antibacterial activity of some marine algae from Chilika Lake (Orissa, India), *Intern J Algae*, 2009, **11**(3), 222-235].

### Aqueous extract of *Abutilon indicum* Sweet inhibits glucose absorption and stimulates insulin secretion in rodents

The scientists at Mahidol University, Bangkok, Thailand evaluated the antidiabetic effects of the aqueous extract derived from the Thai *Abutilon indicum* Sweet plant and explored its effects on intestinal glucose absorption and insulin secretion. The authors hypothesized that the plasma glucose level could be reduced through the inhibition of glucose absorption and/or the enhancement of insulin secretion. Administration of the extract (0.5 and 1g/kg body weight) in an oral glucose tolerance test led to a significant reduction

in plasma glucose levels in 30 min after the administration in moderately diabetic rats, as compared with untreated rats ( $P < 0.05$ ) and this was at a faster rate than the use of an antidiabetic drug, glibenclamide. The inhibition of glucose absorption through the small intestine was investigated using an everted intestinal sac. The results showed that the extract at concentrations of 0.156 to 5mg/ml caused a reduction of glucose absorption in a dose response manner. The maximum response was noted at a dose of 2.5 mg/ml. The promotion of the extract on insulin

secretion was confirmed by incubating  $\beta$  cell of pancreatic islets and INS-1E insulinoma cells with the extract at 1 to 1000  $\mu\text{g/ml}$ . These observations suggest that the aqueous extract from the *A. indicum* plant has antidiabetic properties, which inhibited glucose absorption and stimulated insulin secretion. Phytochemical screening also revealed that the extract contained alkaloids, flavonoids, tannins, glycosides and saponins that could account for the observed pharmacological effects of the plant extract [Krisanapun Chutwadee,

Peungvicha Penchom, Temsiririrkkul Rungravi and Wongkrajang Yuvadee, Aqueous extract of

*Abutilon indicum* Sweet inhibits glucose absorption and stimulates insulin secretion in

rodents, *Nutr Res*, 2009, **29**(8), 579-587].

### Immunomodulatory and anticancer activities of phenolics from *Garcinia mangostana* Linn. fruit pericarp

Many tropical plants have important biological activities with potential therapeutic applications. Mangosteen, *Garcinia mangostana* Linn. (GM) is a climacteric fruit, named as 'the queen of fruits'. It is widely distributed in subtropical regions, and well-accepted by consumers due to the delicious taste. It is often used for traditional medicines including the treatment of abdominal pain, dysentery, diarrhoea, suppuration, infected wound, leucorrhoea, chronic ulcer and gonorrhoea. The researchers at China carried out studies to isolate and purify three major phenolics from *G. mangostana* pericarp, and to investigate their antioxidant, immunomodulatory and anticancer activities.

The methanolic extract of fruit pericarp was partitioned into butanol and



water fractions. Three major phenolics were purified and identified as P<sub>1</sub> [1,3,6,7-tetrahydroxy-2,8-(3-methyl-2-butenyl) xanthone], P<sub>2</sub> [1,3,6-trihydroxy-7-methoxy-2,8-(3-methyl-2-butenyl)

xanthone] and P<sub>3</sub> (epicatechin). Strong antioxidant activities were detected for P<sub>1</sub>-P<sub>3</sub>. *In vitro* cell proliferation trials indicated that P<sub>1</sub> and P<sub>3</sub> exhibited good immunomodulatory activities when 7.5 µg/ml was used. Furthermore, P<sub>1</sub> and P<sub>3</sub> showed good cytotoxicities against human breast cancer cells (MCF-7) and human colon cancer cells (LOVO). P<sub>1</sub> exhibited the maximal cytotoxicity of 73.06% against MCF-7 cells and of 46.27% against LOVO cells when 62.5 µg/ml was used. The cytotoxicities of P<sub>1</sub>, P<sub>2</sub>, P<sub>3</sub> and paclitaxel against normal embryonic lung fibroblast cells (HELF) were in a decreasing order: paclitaxel > P<sub>3</sub> > P<sub>1</sub> > P<sub>2</sub>. These results suggested that P<sub>1</sub> and P<sub>3</sub> could be used as a potential anticancer agent [Yu Limei, Zhao Mouming, Yang Bao and Bai Weidong, Immunomodulatory and anticancer activities of phenolics from *Garcinia mangostana* fruit pericarp, *Food Chem*, 2009, **116** (4), 969-973].

### Anti-allergic effects of herbal product from *Allium cepa* Linn. bulb

*Allium cepa* Linn. (Family — Liliaceae) is a reputed Indian medicinal herb that is prescribed as an effective remedy for several ailments in the Ayurvedic system of medicine. The scientists at Indian Institute of Integrative Medicine, Jammu-Tawi, India evaluated its efficacy against various events

responsible for Type I allergic reactions. A herbal fraction (ALC-02) from bulb inhibited histamine release and attenuated intracellular calcium levels in Compound 48/80-induced rat peritoneal mast cells. It also prevented Compound 48/80-mediated systemic anaphylaxis while lowering histamine levels in plasma.

ALC-02 suppressed carrageenan-induced rat paw edema. It inhibited eosinophil peroxidase activity and protein content in bronchoalveolar lavage fluid (BALF) of ovalbumin-challenged mice. In this experiment ALC-02 also caused a substantial reduction in lipid peroxidation in BALF/lung tissue and augmented

superoxide dismutase activity in lung tissue. ALC-02 suppressed erythrocytic lysis caused by Triton X-100. A significant quenching of 1,1-diphenyl-2-picrylhydrazyl radical by ALC-02 was

observed. The results have shown a promising anti-allergic profile of ALC-02 that could be attributed to its potential antihistaminic, anti-inflammatory, and antioxidant activities [Kaiser P, Youssouf MS,

Tasduq SA, Singh S, Sharma SC, Singh GD, Gupta VK, Gupta BD and Johri RK, Anti-allergic effects of herbal product from *Allium cepa* Linn. bulb, *J Medic Food*, 2009, **12**(2), 374-382].

## Mulberry leaf extract restores arterial pressure in streptozotocin-induced chronic diabetic rats

Free radical-induced vascular dysfunction plays a key role in the pathogenesis of vascular disease found in chronic diabetic patients. *Morus alba* Linn. (MA) leaf extract is promoted for good health especially in diabetic patients. Interestingly, antidiabetic and antioxidant activities of MA have been reported in experimental animals. The researchers at Thailand evaluated the effect of long-term treatment with MA which could improve vascular reactivity of chronic diabetic rats. To test this hypothesis, they examined the effect of long-term treatment with MA on the vascular responses to vasoactive agents in streptozotocin-induced chronic diabetic rats. The diabetic rats were either orally administered with distilled water, MA (0.25, 0.5 and 1 g/kg per day) or

subcutaneously injected with insulin (4 U/kg per day) for 8 weeks. After each treatment, the fasting blood glucose, blood pressure, vascular responses to vasoactive agents and tissue malondialdehyde were examined. *Morus alba* at the doses of 0.5 and 1g/kg, which significantly reduced blood glucose level, also significantly decreased the high blood pressure in diabetic rats. Vascular responses of the chronic diabetic rats to vasodilators, acetylcholine (3-30 nmol/kg) and sodium nitroprusside (1-10 nmol/kg) were significantly suppressed by 26 to 44% and 45 to 77%, respectively, whereas those to vasoconstrictor, phenylephrine (0.01-0.1µmol/kg) were significantly increased by 23 to 38% as compared to normal rats. Interestingly, the

administration of 0.5 and 1g/kg MA or 4 U/kg insulin significantly restored the vascular reactivities of diabetic rats. Moreover, 8 weeks of diabetes resulted in the elevation of malondialdehyde content in tissues (liver, kidney, heart, and aorta), and MA treatment significantly lessened this increase. These results provide the first evidence for the efficacy of MA in restoring the vascular reactivity of diabetic rats, the mechanism of which may associate with the alleviation of oxidative stress [Naowaboot Jarinyaporn, Pannangpetch Patchareewan, Kukongviriyapan Veerapol, Kukongviriyapan Upa, Saowanee Nakmareong and Arunporn Itharat, Mulberry leaf extract restores arterial pressure in streptozotocin-induced chronic diabetic rats, *Nutr Res*, 2009, **29**(8), 602-608].

## Feeding orange pulp improved bone quality in a rat model of male osteoporosis

Oxidative stress and inflammation have been linked to bone loss. The researchers at Texas evaluated the effects of feeding orange pulp (OP), a source of vitamin C and flavonoids, on bone quality in a rat model of male osteoporosis. One-year-old retired breeder rats ( $n=43$ ) were orchidectomized (ORX) or sham-operated (SHAM). Three days postsurgery, ORX rats were randomly

assigned to treatments: ORX or ORX with 2.5, 5, or 10% OP. Diets were isonitrogenous, isocaloric, modified AIN-93M diets with equal fibre content. All ORX rats were fed for 4 months to the mean food intake of the SHAM group. At the end of the study blood, urine and bone samples were collected. Plasma antioxidant capacity and urinary deoxyypyridinoline (DPD) were

determined. Bone density, structure, and strength were assessed using dual energy X-ray absorptiometry, microcomputed tomography, and finite element analyses. ORX decreased ( $P < 0.05$ ) antioxidant status, while OP as low as 2.5% maintained the antioxidant capacity of ORX rats comparable to that of the SHAM group. Cortical thickness at the tibial midshaft was significantly decreased by

ORX and increased by OP, and urinary DPD was significantly increased by ORX and decreased by OP. In fourth lumbar trabecular cores, ORX rats had significantly reduced bone volume fraction, connectivity density, and trabecular number and increased trabecular separation. OP significantly

increased bone volume fraction and trabecular number and decreased trabecular separation in ORX rats. Improvements due to OP in microarchitectural properties of vertebral bones and in cortical thickness of long bones were subtle but significant. The consistently negative impacts of ORX on

bone density, structure, and strength parameters confirm the previously reported importance of testosterone for bone [Morrow Rori, Deyhim Farzad, Patil Bhimanagouda S and Stoecker Barbara J, Feeding orange pulp improved bone quality in a rat model of male osteoporosis, *J Medic Food*, 2009, **12**(2), 298-303].

### Camel milk as an adjuvant therapy for the treatment of type 1 diabetes

There is a traditional belief in the Middle East that regular consumption of camel milk may aid in prevention and control of diabetes. Therefore the researchers at Cairo evaluated the efficacy of camel milk as an adjuvant therapy in young type 1 diabetics. This 16-weeks randomized study enrolled 54 type 1 diabetic patients (average age 20 years) selected from those attending the outpatient diabetes clinic of the Menofia University Hospital, affiliated with National Cancer Institute, Egypt. Subjects were randomly divided into two groups of 27 patients: one received usual management (diet, exercise, and insulin), whereas the other received 500 ml of camel milk daily in addition to standard management. A control group of 10

healthy subjects was also assessed. The following parameters were evaluated at baseline and at 4 and 16 weeks: haemoglobin A1c (HbA1c), human C-peptide, lipid profile, serum insulin, anti-insulin antibodies, creatinine clearance, albumin in 24-hour urine, body mass index, and Diabetes Quality of Life score. The following parameters were significantly different between the usual-management group versus the camel milk group after 16 weeks: fasting blood sugar ( $227.2 \pm 17.7$  vs.  $98.9 \pm 16.2$  mg/dl), HbA1c ( $9.59 \pm 2.05\%$  vs.  $7.16 \pm 1.84\%$ ), serum anti-insulin antibodies ( $26.20 \pm 7.69$  vs.  $20.92 \pm 5.45$   $\mu$ U/ml), urinary albumin excretion ( $25.17 \pm 5.43$  vs.  $14.54 \pm 5.62$  mg/dl/24 h), daily insulin dose ( $48.1 \pm 6.95$  vs.  $23 \pm 4.05$  units),

and body mass index ( $18.43 \pm 3.59$  vs.  $24.3 \pm 2.95$  kg/m<sup>2</sup>). Most notably, C-peptide levels were markedly higher in the camel milk group ( $0.28 \pm 0.6$  vs.  $2.30 \pm 0.51$  pmol/ml). These results suggest that, as an adjunct to standard management, daily ingestion of camel milk can aid metabolic control in young type 1 diabetics, at least in part by boosting endogenous insulin secretion [Mohamad Ragaa Hosny, Zekry Zekry Khalid, Al-Mehdar Hussain A, Salama Omar, El-Shaieb Siad Ebrahim, El-Basmy Amany A, Al-said Mohamad Gamil Abdel Monem and Sharawy Sabry Mohamed, Camel Milk as an Adjuvant Therapy for the Treatment of Type 1 Diabetes: Verification of a Traditional Ethnomedical Practice, *J Medic Food*, 2009, **12**(2), 461-465].

### *In vitro* antioxidant activity of *Amaranthus lividus* Linn.

Water, methanol and ethyl acetate extracts from stems with leaves and flowers of *Amaranthus lividus* Linn., one of the most popular leafy vegetable consumed in the west Black Sea region of Turkey, were tested *in vitro* for their ability to inhibit peroxidation of phosphatidylcholine liposomes induced with Fe<sup>3+</sup>/ascorbate, to scavenge ABTS<sup>•+</sup>,

DPPH and hydroxyl radicals, to reduce Fe (III) to Fe (II) and to chelate Fe (II) ions. The results showed that amaranth vegetable contained naturally occurring antioxidant components and possessed antioxidant activity which may be attributed to its lipid peroxidation inhibitory, radical scavenging and metal chelating activities. The antioxidant

activities of the water and ethyl acetate extracts were not concomitant with the development of their reducing power. It was concluded that *A. lividus* might be a potential source of antioxidants [Ozsoy N, Yilmaz T, Kurt O, Can A and Yanardag R, *In vitro* antioxidant activity of *Amaranthus lividus* L., *Food Chem*, 2009, **116** (4), 867-872].

## Antioxidant activity of rye bran alkylresorcinols and extracts from whole-grain cereal products

Researchers at Faculty of Biotechnology, Department of Lipids and Liposomes, University of Wrocław, Przybyszewskiego, Wrocław, Poland evaluated the antioxidant properties of rye bran alkylresorcinols (C15:0-C25:0) and extracts from whole-grain cereal products using their radical-scavenging activity on DPPH and the chemiluminescence method (CL). DPPH radical reduction varied from ~10 to ~60% for the alkylresorcinol homologues at concentrations from 5 to 300  $\mu\text{M}$  and was not dependent on the length of the alkyl side chain of the particular homologue. Differences in the  $\text{EC}_{50}$  values for the studied compounds were not statistically significant, the values varying from 157  $\mu\text{M}$  for homologue C23:0 to 195  $\mu\text{M}$  for homologue C15:0. Moreover, values

of  $\text{EC}_{50}$  for all the alkylresorcinol homologues were significantly higher than those for Trolox and  $\alpha$ -,  $\delta$ -, and  $\gamma$ -tocopherols, compounds with well-defined antioxidant activity and used as positive controls. CL inhibition was evaluated for all the tested alkylresorcinol homologues at concentrations of 5 and 10  $\mu\text{M}$  and varied from ~27 to ~77%. Similar to the DPPH method, the slight differences in CL inhibition suggest that the length of the alkyl side chain had no major impact on their antioxidant properties. The extracts from whole-grain products were added to the DPPH and CL reaction systems and their antioxidant activities were tested and compared with the total amount of alkylresorcinols evaluated in the extracts. DPPH radical and CL reduction for the whole-grain

products varied from ~70 to ~43% and from ~37 to ~91%, respectively. A clear relationship between DPPH radical and CL reduction levels and the amount of total alkylresorcinols was obtained for whole-grain breakfast cereals, in which the reduction level decreased in the order rye > wheat > mixed > barley. Therefore, it may be considered that the antioxidant activity of alkylresorcinols could be of potential importance to the food industry, which is continuously searching for natural antioxidants for the protection of food products during their processing and storage [Korycińska Mariola, Czelną Karolina, Jaromin Anna and Kozubek Arkadiusz, Antioxidant activity of rye bran alkylresorcinols and extracts from whole-grain cereal products, *Food Chem*, 2009, **116** (4), 1013-1018].

## *In vivo* hypoglycemic effects of phenolics from the root bark of *Morus alba* Linn.

The root bark of *Morus alba* Linn., called *Sang-Bai-Pi* in China, has a long history as traditional Chinese medicine. It is used primarily in the treatment of lung-heat, cough, hematemesis, dropsy, beriberi, and difficulty in micturition etc. in folk. Researchers at China investigated the hypoglycemic effect of isolated compounds from the root bark (*Cortex Mori*) on alloxan-diabetic mice. Moracin

M (1), Steppogenin-4'-O- $\beta$ -D-glucoside (2), Mullberroside A (3) were isolated from the root bark and identified by spectral evidence. Compounds 1, 2 and 3 were studied in hypoglycemic effects on alloxan-diabetic mice. The results showed that compounds 1, 2 and 3 all produced hypoglycemic effects. The compound 2 in a dose of 50 mg/kg exerted significant effect ( $P < 0.05$ ), 2 and 3 in a dose of 100 mg/kg exerted obviously effect

( $P < 0.01$ ). Meantime, the compound 1 in a dose of 100 mg/kg can make the fasting blood glucose level have decreasing tendency. Thus, it can be said that *Cortex Mori* is a good and potential natural material to treat diabetes, or to develop an adjuvant agent for diabetes [Zhang Mi, Chen Man, Zhang Han-Qing, Sun Shi, Xia Bing and Wu Fei-Hua, *In vivo* hypoglycemic effects of phenolics from the root bark of *Morus alba*, *Fitoterapia*, 2009, **80** (8), 475-477].

### Antimicrobial activity of pomegranate (*Punica granatum* Linn.) fruit peels

Food-borne diseases such as listeriosis and diseases caused by the emergence of multi-drug resistant pathogens (e.g. *Staphylococcus aureus*) are globally recognized as environmental hazards to the food supply and human health. Natural inhibitors for pathogenic microorganisms have been explored in many plants. The antimicrobial activity against some food-borne pathogens by various extracts from pomegranate (*Punica granatum* Linn.) fruit peels was evaluated by a researcher at Department of Food Science & Nutrition, College of Agricultural and

Food Sciences, King Faisal University, Al-Ahsa, Saudi Arabia using both *in vitro* (agar diffusion) and *in situ* (food) methods. The 80% methanolic extract of peels (WME) was a potent inhibitor for *Listeria monocytogenes*, *S. aureus*, *Escherichia coli* and *Yersinia enterocolitica*. The minimum inhibitory concentration (MIC) of WME against *Salmonella enteritidis* was the highest (4 mg/ml). WME afforded  $> 1 \log_{10}$  reduction of *L. monocytogenes* in food (fish) during storage at 4°C. Phytochemical analyses revealed the presence of active inhibitors in peels,

including phenolics and flavonoids. The activity of WME was related to its higher content (262.5 mg/g) of total phenolics.

Human pathogens such as *L. monocytogenes* which are ubiquitous in the environment showed sensitivity to peel extracts *in vitro* (agar diffusion) and *in situ* (chilled fish). Added-value items from byproducts of food could provide health benefits to humans and may be employed in food preservation and pharmaceutical purposes [Al-Zoreky NS, Antimicrobial activity of pomegranate (*Punica granatum* L.) fruit peels, *Int J Food Microbiol*, 2009, **134** (3), 244-248].

### Antioxidant and lipoxygenase inhibitory activities of pumpkin seed extracts

Pumpkin seeds are a popular snack food in several countries. They are consumed either raw or roasted (salted or not) and used in cooking and baking as an ingredient of bread, cereals, salads and cakes. Moreover, pumpkin seed oil now-a-days gains wide acceptance not only as edible oil but as a nutraceutical, too. Pumpkin seeds have been implicated in providing health benefits. However, antioxidant or anti-inflammatory activity of their extracts has not been studied earlier. Therefore, researchers at Department of Science of Nutrition-Dietetics, Harokopio University, Athens,

Greece treated four commercially available pumpkin seeds with two different extraction methodologies in order to obtain fractions with different content. The extracts were screened for their antioxidant activity using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay and for their inhibitory activity against lipid peroxidation catalyzed by soybean lipoxygenase.

Most extracts tested have demonstrated radical scavenging activity, which depends on their total phenolic content, with fractions rich in phenolics

showing the strongest activity. On the other hand, the phenolic content of extracts does not determine their activity against lipoxygenase, as acetone and polar lipid fractions are its strongest inhibitors. The presence of molecules being able to scavenge radicals and inhibit lipoxygenase in pumpkin seeds may in part explain the health benefits attributed to them [Xanthopoulou Marianna N, Nomikos Tzortzis, Fragopoulou Elizabeth and Antonopoulou Smaragdi, Antioxidant and lipoxygenase inhibitory activities of pumpkin seed extracts, *Food Res Int*, 2009, **42** (5-6), 641-646].