Neither water vapour diffusivity nor permeability was affected significantly by MG content. However, the incorporation of increasing amounts of MG in the formulation resulted in films with improved flexibility, that is, with significantly lower tensile strength and higher elongation at break. This result suggests the use of MG to improve mechanical properties of WPI films as an alternative of using larger amounts of low molecular weight plasticizers [Osés Javier, Fabregat-Vázquez Mayra, Pedroza-Islas Ruth, Tomás Sergio A, Cruz-Orea Alfredo and Maté Juan I, Development and characterization of composite edible films based on whey protein isolate and mesquite gum, *J Food Eng*, 2009, **92**(1), 56-62].

Antifungal activity of films and solutions based on chitosan against typical seed fungi

The use of eco-freindly polymers as antimicrobial materials is in growth due to the need to reduce the negative impact of conventional treatments on the environment and the human health. The purpose of the study done by researchers at Department of Food Technology, Universidad Pública de Navarra, Campus Arrosadia, Pamplona, Spain was to assess the antifungal properties of films and solutions based on chitosan with different molecular weight at different concentrations. Surfactants were added to the formulation to assess their impact on treatment efficiency. The antifungal activity was conducted against three fungi, *Aspergillus niger, Alternaria alternata* and *Rhizopus oryzae*. Results indicated important and significant differences of the antifungal activity between chitosan based solutions and chitosan based films. Furthermore, the antifungal activity of the different treatment depended on the type of fungus treated. Thus, chitosan film treatments were significantly more effective on *A. niger* than solution treatments. On the other hand, solution treatments resulted in higher radial inhibition when applied against *A. alternata* or *R. oryzae*. The highest radial inhibition was observed against *A. alternata* (97%) using a chitosan solution. The influence of the other parameters (concentration, molecular weight and surfactant type) on treatment efficiency was not as important and their significance depended on treatment type and fungus nature [Ziani Khalid, Fernández-Pan Idoya, Royo Maite and Maté Juan I, Antifungal activity of films and solutions based on chitosan against typical seed fungi, *Food Hydrocol*, 2009, **23** (8), 2309-2314].

Fumigant toxicity of essential oil from *Vitex pseudo-negundo* against *Tribolium castaneum* (Herbst) and *Sitophilus oryzae* (L.)

The scientists at Iran carried out studies to determine the chemical constituents and fumigant toxicity of an essential oil that was isolated via hydrodistillation from dry leaves of ***Vitex pseudo-negundo*** **(Hausskn.) Hand.-Mzz**. The chemical composition of the essential oil was assessed via GC and GC-MS. 1, 8-Cineol (18.23%), α-Pinene (16.20%) and Sabinene (5.67%) were determined to be the major constituents of the oil. The fumigant toxicity of the essential oil was tested against 1-7day old adults of *Tribolium castaneum* (Herbst) and *Sitophilus oryzae* (Linn.) at 27±1°C and 60±5% RH in darkness. The mortality of adults was tested at different concentrations ranging from 37.0 to 925.9µl/l air and different exposure times (1-30h). The results demonstrated that the mortality increased with increases in concentration and exposure time. At concentrations higher than 185.2µl/l air, the mortality was

recorded at more than 50% after 10h and reached 100% after 12-16h. Data probit analysis demonstrated that *S. oryzae* (LC_{50}=31.96µl/l air) was more susceptible than *T. castaneum* (LC_{50}=47.27µl/l air). These results showed that the essential oil from ***V. pseudo-negundo*** could be applicable to the management of populations of stored-product insects [Sahaf Bibi Zahra, Moharramipour Saeid and Meshkatalsadat Mohammad Hadi, Fumigant toxicity of essential oil from *Vitex pseudo-negundo* against *Tribolium castaneum* (Herbst) and *Sitophilus oryzae* (L.), *J Asia-Pacific Entomol*, 2008, **11**(4), 175-179].

Efficacy of *Lippia alba* (Mill.) N.E. Brown essential oil against fungi isolated from some edible legume seeds and aflatoxin B_1 production

A study was conducted by researchers at Laboratory of Herbal Pesticides, Centre of Advanced Study in Botany, Banaras Hindu University, Varanasi, India to evaluate the antifungal properties of ***Lippia alba*** **(Mill.) N.E. Brown** essential oil (EO) and two of its monoterpene aldehyde constituents against legume-contaminating fungi. Seventeen different fungal species were isolated from 11 varieties of legumes, and aflatoxigenic isolates of *Aspergillus flavus* were identified. Hydrodistillation method was used to extract the EO from fresh leaves. The GC and GC-MS analysis of EO revealed the monoterpene aldehydes viz. geranial (22.2%) and neral (14.2%) as the major components. The antifungal activity of EO, geranial and neral was evaluated by contact assay on Czapek's-dox agar. The EO (0.25-1 µl/ml) and its two constituents (1 µl/ml) showed remarkable antifungal effects against all the fungal isolates (growth inhibition range 32.1-100%). Their minimal inhibitory (MIC) and fungicidal (MFC) concentrations for *A. flavus* were lower than those of the systemic fungicide Bavistin. Aflatoxin B_1 (AFB_1) production by three isolates of *A. flavus* was strongly inhibited even at the lower fungistatic concentration of EO and its constituents. There was no adverse effect of treatments on seed germination, and rather, there was enhanced seedling growth in the EO-treated seeds. It is concluded that ***L. alba*** EO and two of its constituents could be safely used as effective preservative for food legumes against fungal infections and mycotoxins.

In conclusion, the findings suggest that ***L. alba*** EO and two of its components are highly effective against the isolated storage fungi and AFB_1 production by *A. flavus*. Hence, the oil could be potentially applied in food preservation, alternatives to synthetic fungicides to improve the storage life of staple foods, especially grains and legumes [Shukla Ravindra, Kumar Ashok, Singh Priyanka and Dubey Nawal Kishore, Efficacy of *Lippia alba* (Mill.) N.E. Brown essential oil and its monoterpene aldehyde constituents against fungi isolated from some edible legume seeds and aflatoxin B_1 production, *Int J Food Microbiol*, 2009, **135** (2), 165-170].

Potential use of Asteraceae extracts to control *Spodoptera frugiperda* and selectivity to their parasitoids *Trichogramma pretiosum* and *Telenomus remus*

Parasitoids of the genus *Telenomus* and *Trichogramma* are used in integrated pest management programs and they are important by parasitizing eggs of Lepidoptera. Biological control agents can be associated with natural products for pest management in the corn culture. Thus, the objective of the study done by scientists at Brazil was to evaluate the effect of extracts of 12 Asteraceae species on eggs and caterpillars of *S. frugiperda* Smith and Abbott and on their parasitoids *Telenomus remus* Nixon and *Trichogramma pretiosum* Riley.

The plants ***Lychnophora ericoides*** **Mart.** and ***Trichogonia villosa*** **Sch. Bip. ex Baker** were toxic for 97.7 ± 0.15% of one-day-old eggs of *S. frugiperda* and *Lepidaploa lilacina* for 72.0 ± 2.50% for two-day-old eggs of

this insect. Extracts of ***Vernonia holosericea*** **Mart. ex DC.**, ***Lychnophora ramosissima*** **Gardener** and ***Chromolaena chaseae*** **(B. L. Rob.) R. M. King & H. Rob.** had higher impact on *S. frugiperda*, while those of ***Eremanthus elaeagnus*** **Sch. Bip.** and ***L. ericoides*** were more selective to *T. pretiosum* and *T. remus*. The higher activity of Asteraceae extracts on eggs and caterpillars of *S. frugiperda* and their selectivity to non-target insects suggest that the most appropriate botanical species for future studies were ***L. ericoides***, ***L. ramosissima*** and ***V. holosericea***. However, the extract from ***V. holosericea*** should be preferred for pest management programs. Thus, Asteraceae extracts present potential for integrated pest management programs of *S. frugiperda* [Tavares Wagner de Souza, Cruz Ivan, Petacci Fernando, Sebastião Lourenço de Assis Júnior, Freitas Silvia de Sousa, Zanuncio José Cola and Serrão José Eduardo, Potential use of Asteraceae extracts to control *Spodoptera frugiperda* (Lepidoptera: Noctuidae) and selectivity to their parasitoids *Trichogramma pretiosum* (Hymenoptera: Trichogrammatidae) and *Telenomus remus* (Hymenoptera: Scelionidae), *Ind Crops Prod*, 2009, **30** (3), 384-388].

Chemical composition and insecticidal properties of *Cinnamomum aromaticum* Nees essential oil

Cinnamomum aromaticum **Nees** is a widely used cooking ingredient in South Asian countries. The researchers at Korea and Bangladesh tested the essential oil of ***C. aromaticum*** against the stored product beetle *Callosobruchus maculatus*. Their objective was to identify the natural compounds with insecticidal properties in this essential oil with a view to its potential use as an alternative to synthetic pesticides. The chemical composition of the hydrodistilled bark essential oil of ***C. aromaticum*** was analysed by gas chromatography/mass spectrometry, and *cis*-cinnamaldehyde (53.90%) was found to be the principal constituent. The surface film and fumigation toxicities and repellency activity against *C. maculatus* were evaluated. The extracted oil showed 94.44% mortality against adult *C. maculatus* through the surface film bioassay. The LD_{50} values were 27.56 and 23.16µg/cm^{-2} after 24 and 48h of exposure, respectively. The regression equations were calculated as $Y = 0.39 + 3.20X$ and $Y = 1.25 + 2.75X$, respectively. In the fumigation bioassay the LD_{50} value was 434.69 µg/cm^{-2} after 24 h of exposure, with the regression equation $Y = 0.87 + 1.57X$. It was also found that the extracted oil contained compounds that had a dose-dependent protective effect on egg hatching and adult emergence. The results obtained from this study suggest that the toxicity and insecticidal activity of ***C. aromaticum*** are attributable to its essential oil, which could be used as a biodegradable and natural bioprotectant for controlling stored product pests [Islam Rezuanul, Khan Rejaul Islam, Al-Reza Sharif M, Jeong Yong Tae, Song Chi Hyun and Khalequzzaman M, Chemical composition and insecticidal properties of *Cinnamomum aromaticum* (Nees) essential oil against the stored product beetle *Callosobruchus maculatus* (F.), *J Sci Food Agric*, 2009, **89**(7), 1241-1246].

Essential oils from edible plants as insecticides against the house fly

The researchers at Argentina analyzed the compositions of 12 essential oils (EOs) obtained by hydrodistillation of edible fruits and herbs by gas chromatography/mass spectroscopy (GC/MS). The insecticidal activity of each oil against the house fly *Musca domestica* was evaluated by placing flies in a glass jar with a screw cap that held a piece of EO-treated cotton yarn. The dose necessary to kill 50% of flies, LC_{50} in 30 min was determined at 26 +/-1°C. Twelve EOs and 17 individual terpenes were assayed against *M. domestica*, showing LC_{50} values ranging from 3.9 to 85.2 and from 3.3 to >100 mg/dm^{-3}, respectively. EO from ***Citrus sinensis*** **(Linn.) Osbeck** was the most potent insecticide (LC_{50} = 3.9 mg/dm^{-3}), followed by EOs from ***C. aurantium*** **Linn.** (LC_{50}= 4.8 mg/dm^{-3}) and ***Eucalyptus cinerea***

(LC_{50}= 5.5 mg/dm^{-3}). According to GC/MS analysis, limonene (92.47%), linalool (1.43%), and b-myrcene (0.88%) were the principal components of ***C. sinensis*** EO. Limonene was also the principal constituent (94.07%) of ***C. aurantium***, while 1,8-cineole (56.86%) was the major constituent of ***E. cinerea*** EO. 1, 8-Cineole was most active against *M. domestica* (LC_{50}= 3.3 mg/dm^{-3}), while (4R) (+)-limonene, was moderately active (LC_{50} = 6.2 mg/dm^{-3}). Dimethyl 2, 2-dichlorovinyl phosphate (DDVP) selected as a positive control, showed an LC_{50} of 0.5 mg/dm^{-3}. EOs from ***C. sinensis***, ***C. aurantium*** and ***E. cinerea*** show promise as natural insecticides against houseflies [Palacios SM, Bertoni A, Rossi Y, Santander R and Urzúa A, Efficacy of essential oils from edible plants as insecticides against the house fly, *Musca domestica* Linn., *Molecules*, 2009, **14**(5),1938-47].

Toxicity of *Ocimum basilicum* Linn. extracts against *Anopheles stephensi* and *Culex quinquefasciatus*

The larvicidal effect of the crude carbon tetrachloride, methanol and petroleum ether leaf extracts of a widely grown medicinal plant, ***Ocimum basilicum* Linn.**, against *Anopheles stephensi* and *Culex quinquefasciatus* was evaluated by the researchers at Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra, India. Petroleum ether extract was found to be the most effective against the larvae of both mosquitoes, with LC_{50} values of 8.29, 4.57; 87.68, 47.25ppm and LC_{90} values of 10.06, 6.06; 129.32, 65.58ppm against *A. stephensi* and *C. quinquefasciatus* being observed after 24 and 48h of treatment, respectively. The efficacy of petroleum ether was followed by that of the carbon tetrachloride and methanol extracts, which had LC_{50} values of 268.61, 143.85; 446.61, 384.84ppm and LC_{90} values of 641.23, 507.80; 923.60, 887.00ppm against *A. stephensi* after 24 and 48h, respectively and LC_{50} values of 24.14, 17.02; 63.48, 53.77ppm and LC_{90} values of 295.38, 204.23; 689.71, 388.87ppm against *C. quinquefasciatus* after 24 and 48h of treatment, respectively. These extracts are highly toxic against mosquito larvae from a range of species; therefore, they may be useful for the management of mosquito larvae to control vector borne diseases [Maurya Prejwltta, Sharma Preeti, Mohan Lalit, Batabyal Lata and Srivastava CN, Evaluation of the toxicity of different phytoextracts of *Ocimum basilicum* against *Anopheles stephensi* and *Culex quinquefasciatus*, *J Asia-Pacific Entomol*, 2009, **12**(2), 113-115].

Oil/Fats

Extraction of safflower seed oil by supercritical CO_2

The researchers at China investigated Safflower seed oil extraction with supercritical CO_2 at series operational parameters of pressure, temperature, flow rate and particle size in a bench scale apparatus. The results show that the extraction yields plotted as a function of time are significantly affected by the extraction pressure, flow rate and particle size, but extraction yields plotted versus CO_2 used are scarcely affected by flow rate. Extraction temperature has a slight effect on the extraction curves. In order to describe the extraction process, the Sovova's extended Lack's Model (SLM) was used and the experimental data were well fitted by it. The extraction was scaled up to pilot plant and the computed values of SLM are in good agreement with the pilot plant data. Additionally, the quality of safflower seed oil obtained by supercritical CO_2 extraction is superior to that of oil obtained by traditional methods. It is noted that a new method of changing flow rate was proposed to improve the process efficiency and proved to be valuable by experiment [Han Xiaojin, Cheng Leming, Zhang Rong and Bi Jicheng, Extraction of safflower seed oil by supercritical CO_2, *J Food Eng*, 2009, **92**(4), 370-376].