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Physical Sciences

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Identification of Kaolin Polytypes and other Minerals in Sediments of Thar Coal Field, Sindh, Pakistan

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(received August 8, 2007; revised December 1, 2007; accepted December 1, 2007)

Abstract. Study of the core samples of powder and clay ($< 2 \mu$) fraction grain size from coal field of Thar, Sindh, Pakistan, for the mineral composition, kaolinization processes and environments of the deposition, indicated both types of kaolinite i.e. well crystalline and degraded, as the main constituents in both the samples. Quartz and anatase were in sub-ordinate amounts in random powder, and dickite in clay fraction. Authigenic and degraded, both types of kaolinite, were present in the sediment. Dickite showed its presence in restricted samples, whereas anatase (TiO_2), detrital of authigenic origin, were present in the whole-rock samples. It is inferred that leaching of kaolinite and sufficient amount of titanium from the Tharparkar granite produced authigenic anatase and some amount of detrital anatase was contributed by the weathering of Nagarparkar granite. Presence of detrital minerals i.e. quartz, kaolinite, anatase and also the iron oxide, suggest a near-shore deposition, under reducing and micro-oxidizing environments.

Keywords: kaolin polytypes, dickite, anatase, nacrite, Thar coal field

Gas Chromatographic and Spectroscopic Analyses of Oils of Wild Rubber (*Funtumia elastica*) Seeds

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Abstract. Oils from seeds of wild rubber (*Funtumia elastica*) of different geographical zones in Ekiti State, Nigeria were analyzed for fatty acid composition using spectroscopic techniques viz: IR, ¹H NMR and ¹³C NMR. The oil content of the seeds ranged from 43.3% to 49.3% with mean of 46.0 ±2.2%. The oils consisted of 14.33-17.77% saturated fatty acids, palmitic and stearic acids and 70.90-88.35% unsaturated fatty acids, oleic, linoleic and linolenic acids, linoleic acid being the most abundant. Very subtle differences were observed among the oil samples in the presence of functional groups such as triglyceride carbonyl, terminal methyl, olefinic unsaturation and esters. Peaks were obtained at δ 2.71-2.73 and δ 25.23-27.60 ppm, showing their allylic positions with absence of conjugation.

Keywords: seed oil, spectroscopy, fatty acid composition, *Funtumia elastica*

Biomass Utilization for Green Environment: Co-Combustion of Diesel Fuel and Producer Gas in Thermal Applications

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(received January 3, 2006; revised August 25, 2007; accepted October 11, 2007)

Abstract. Study of co-combustion of diesel oil and producer gas from a gasifier, individually as well as combined, in an experimental combustion chamber revealed that the producer gas can be co-combusted with liquid fuel. The process produced more CO, NO_x, SO₂ and CO₂ as compared to the combustion of diesel oil alone; the exhaust temperature for the process was higher than the diesel combustion alone.

Keywords: biomass utilization, co-combustion, palm oil solid waste, producer gas, diesel oil, dual fuel engine

Short Communication

Cis and *Trans* Monoenoic Fatty Acids of Hydrogenated Mango Kernel Fats

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(received September 20, 2007; revised December 13, 2007; accepted December 15, 2007)

Abstract: The fats produced as a result of hydrogenation of the oils of three varieties of mango kernel (*Mangifera indica*), were found to consist of *trans* fatty acids, C_{16:1} (0.02-0.60 %), C_{18:1} (2.69-4.48 %), C_{20:1} (0.02-0.04 %), C_{22:1} (traces-0.05 %), C_{24:1} (traces-0.02 %) in addition to *cis* fatty acids.

Keywords: *Mangifera indica*, agro-waste, hydrogenation, mango kernel fats, fatty acids

Short Communication

Study of the Changes in the Dietary Fatty Acids and Physicochemical Values of Sweet and Bitter Apricot Oils in Pakistan

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(received November 28, 2006; revised November 20, 2007; accepted December 2, 2007)

Abstract. The quantity of oil in local varieties of sweet and bitter apricot was found to be more than that earlier reported for the Indian varieties. Both, sweet and bitter apricot oils, were semi-drying type. Refractive index of bitter apricot oil was higher whereas, free fatty acids were more in sweet apricot oil. Amount of cyanide, cadmium, antimony, arsenic, lead and copper as well as of palmitic acid insignificantly increased with ripening, being more in bitter apricot oil. Major difference was noted in fatty acid composition. Linoleic acid was present in higher amount in sweet apricot oil (21.4%) than in bitter apricot oil (19.6%). Concentration of palmitic acid in sweet oil was 5.0%, while in bitter oil, it was 6.4%.

Keywords: apricot oils, non-conventional oils, fatty acid composition

Effect of Plant Density and Nitrogen Rate on Essential Oils of Marjoram under Mediterranean Conditions

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Abstract. Quantitative analysis of essential oils of marjoram, which is grown in Jordan, yielded thymol as major compound. The yield of essential oils increased with the reduction of plant density. The increase in nitrogen dose (from 50 to 100 kg/ha) correlated with the increase in the yield of essential oils in all harvests, while with the increase in the dose of nitrogen from 100- 150 kg/ha, the yield of essential oils decreased. On the other hand, the nitrogen dose of 150 kg/ha correlated with essential oils containing the highest percentage of thymol (53.11%). A strong relation was found between the yield and the chemical composition of marjoram essential oils and applied agronomic treatments which require special attention.

Keywords: essential oils, *Origanum syriacum*, nitrogen dose, plant density

Effect of Ionizing Radiations on *Escherichia coli* and *Pseudomonas lundensis* in Minced Beef and Chicken

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Abstract. *Escherichia coli* and *Pseudomonas lundensis* in minced beef and chicken were subjected to radiation doses of 0.5, 1.0, 1.4, 1.9, 2.3 and 2.9 kGy and 0.3, 0.6, 0.8, 1.0 and 1.4 kGy, respectively, for bacterial inactivation. *E. coli* count on minced beef was reduced by 6 log cycles after a radiation dose of 1.4 kGy, with a D_{10} value of 0.23, whereas, *P. lundensis* count in minced chicken was reduced by 5 log cycles after a radiation dose of 1.0 kGy, with a D_{10} value of 0.18. *E. coli* and *P. lundensis* were sensitive to radiation treatments and relatively low doses of radiation reduced their numbers significantly.

Keywords: *E. coli*, *P. lundensis*, gamma rays, irradiation, meat shelf life

Kernel Size in Relation to Hardness Score and Other Physicochemical Characteristics of Wheat

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(received July 18, 2007; revised December 3, 2007; accepted December 8, 2007)

Abstract. Twelve Pakistani wheat cultivars were studied for the effect of kernel size on the physicochemical characteristics. Thousand-kernel weight (TKW) ranged from 40-48.2 g for large kernels, 32-39 g for medium size kernels and from 24-29.2 g for small kernels. A highly significant relationship ($r = 0.650$) was found between TKW and NIR hardness score. Shriveled kernels contained the highest protein content and broken kernels, the lowest. Other consistently positive but statistically non-significant relationship was observed between TKW and the gluten content. No consistent relationship was found between the gluten index, the falling number, the moisture content and the kernel size and form.

Keywords: wheat kernel size, hardness score, gluten index, protein content

Short Communication

Diagnosis and Efficacy of *Brucella abortus* Strain RB51 in Experimentally Inoculated Sprague - Dawley Rats Using Dot Blot Assay

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Abstract. Sprague-Dawley (SD) rats were experimentally inoculated with *Brucella abortus* strain RB51 and challenged 4 weeks post inoculation with *B. abortus* biotype 1. Monitoring of the sera by dot-blot assay and clinical examination of the rats revealed the highest immune response. SRB51 was isolated from the blood of all inoculated rats until 1st week post inoculation without any clinical sign. It is concluded that SRB51 produces immunity in SD rats and induces protection against *B. abortus* biotype 1 and that Dot Blot Assay is an easy, less time consuming and correct-result reading test.

Keywords: *B. abortus* strain RB51, *B. abortus* biotype 1, Sprague-Dawley rats, dot blot assay, South Korea

Technology

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Influence of Medium Components and Physical Factors on Vitamin B₁₂ Production by *Pseudomonas* sp. PCSIR 99

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Abstract. Study of the influence of various carbon sources on production of vitamin B₁₂ by *Pseudomonas* sp. PCSIR 99 showed that methanol, methylamine and 1, 2-propanediol promoted vitamin B₁₂ production when grown on the modified basal medium emended with 0.2% 5, 6-dimethylbenzimidazole. Among the nitrogen sources tested, L-aspartate and L-methionine enhanced vitamin B₁₂ production and cell mass dramatically. Any upward or downward change in pH from 6.5 and in temperature from 32 °C decreased the level of vitamin B₁₂ in the medium. Whereas, 10% oxygen and 0.004 mM cobalt ion concentration increased vitamin B₁₂ production significantly. It is inferred that vitamin B₁₂ production can also be regulated by proper manipulation of physical parameters of the medium as well.

Keywords: vitamin B₁₂; *Pseudomonas* sp; methanol; 5, 6-dimethylbenzimidazole; L-aspartate; L-methionine; cobalt ions; propanediol

Short Communication

Production of Lactic Acid from Corn Cobs Through Fermentation by *Lactobacillus delbruekii*

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(received November 20, 2007; revised December 18, 2007; accepted December 20, 2007)

Abstract. Corn cobs were used as the source of reducing sugars for conversion into lactic acid through fermentation by a local strain of *Lactobacillus delbruekii*, under varying parameters of time, temperature, pH and glucose concentration. The production of lactic acid significantly increased with increase in pH, fermentation time and glucose concentration (1-5%) and was significantly high (8.40 g/l) at pH 6, while significantly low (7.67 g/l) at pH 5.

Keywords: corn cobs, fermentation, lactic acid, *Lactobacillus delbruekii*
