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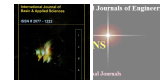
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Antioxidant Activities of Extracts of Trengguli Stem Bark (*Cassia fistula* L.)

Hermien Noorhajati, Mulyadi Tanjung, Nanik Siti Aminah and Ami Suwandi J.S.

Abstract-- This research is conducted to examine the antioxidant activity on the extract of stem bark *C.fistula*. The antioxidant activities of *C.fistula* stem bark extract were evaluated with lipid peroxides test using ferric thiosyanat method (FTC) and 2,6-di-t-butyl-4-metilfenol (BHT) as standard equivalent antioxidant capacity. *C.fistula* stem bark maceration successively used solvent normal heksane (non polar), ethyl acetate (semi-polar) and methanol (polar).

The etyl acetate extract (Ea) shows higher antioxidant activity than the n.hexane extract (Hx) and methanol extract (MeOH). Therefore, the sequence of antioxidant activity is as follows ethyl acetate extract > methanol extract > n.hexane extract, with antioxidant activity consecutively at 5 hours: 65.98%, 58.19% and 32.66%. Those amount are equivalent to the standard synthetic antioxidant BHT (100 ppm), which causes 95.7% antioxidant activity (in 5 hours) inhibition of linoleic acid peroxidation.

There is a connection between antioxidant activity of an extract with the content of the total phenol in each extract. From the assay of phenolic extracts with the method of Folin-Ciocalteu reagent (FCR) and also using afzelechin standard as a comparison, we find that the ethyl acetate extract has the highest total phenolic where the entire sequences are as follows: Ea> MeOH> Hx. with total phenol content consecutive 177.55, 123.2167, 7.433333

Index Term-- Cassia fistula, Antioxidant, Lipid peroxide, Total Phenolic.

I. INTRODUCTION

Cassia fistula Linn is known as Aragvadha in Ayurveda is an

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important medicinal plant belonging to family Caesalpiniaceae. The stem bark is anti dysenteric, laxative and diuretic [11][16]. The whole plant possesses medicinal properties useful in the treatment of skin diseases, inflammatory diseases, rheumatism, anorexia and jaundice [12]. It is a medium sized deciduous tree that reaches the height of about 8-15m to 24m. The young stem bark is of greenish grey smooth and rough, dark brown in color when mature. Leaves are alternate, pinnate, 1 to 1.5 feet long and possess pairs of four to eight ovate leaflets. It bears yellow colored flowers. The fruit beared by the amaltas tree is pendulous, cylindrical, brown and septate having a length of 25 to 45 centimeters and possess a diameter of 1 to 3 centimeters. It has within it about 30 to 100 seeds [16].

Recognized by the British Pharmacopoeia [2], *C. fistula*, a member of the family Leguminosae, is widely used for its medicinal properties. It has been reported that the extract *C. fistula* possessed a variety of biological and pharmacological activities, extract *C. fistula* showed antiinflammatory activity and hypoglycaemic activity, also showed antibacterial, antitumor, hepatoprotective, antifertility, antioxidant [22]. In the Indian literature, this plant has been described to be useful against skin diseases, liver troubles, tuberculous glands and its use in the treatment of haematemesis, pruritus, leucoderm and diabetes. It also has been suggested that *C. fistula* extract is used as an anti-periodic agent and in the treatment of rheumatism [2] [12][22]. The leaf extract is also indicated for its anti-tussive and wound healing properties [4] [5].

Antioxidants are needed in food, as food additives. They also served to prolong the shelf life of food and maintain food safety, nutritional quality, functionality and palatability [13]. Antioxidants must be non-toxic, relatively inexpensive, and effective. They should also have a carrythrough effect during processing, and should not alter the quality of the end-product [13]. The process of lipid oxidation in foods is one of the main causes of chemical decomposition, resulting in rancidity and / or damage, the nutritional quality of the color, flavor texture, and safety in food during storage and processing [1]. Other than that antioxidants are substances that the body needs to neutralize free radicals and prevent damage caused by free radicals on normal cells, proteins and fats. Free radicals can cause various diseases.

The lipid oxidation process is involved in oxidative damage occurring at a cellular level leads to aging, because lipids,

which should keep the skin to stay fresh changes to the lipid peroxide reacts with free radicals that accelerate aging [17]. Oxidative effects may also increase levels of LDL (Low density lipoprotein), which then causes the accumulation of cholesterol in the blood vessel walls. This resulted in the onset of atherosclerosis or more commonly known as coronary heart disease. Free radical mediated peroxidation of membrane lipids and oxidative damage of DNA are believed to be associated with a variety of chronic health problems, such as cancer, atherosclerosis, neurodegenerative diseases and aging [3][7]. Coronary heart disease (CHD) is a disease which killed an estimated 15 million people or about 30% of the total causes of death and is expected to increase to 40% by 2020 (WHO, 2001). There are three stages of work processes of antioxidants in the body, prevent or inhibit the occurrence of fat peroxide, capturing reactive oxygen species (ROS) and also repair damage caused by ROS. Which include reactive oxygen species (ROS) are superoxide (O_2^*), hydroxyl (HO^*), peroxy (ROO^*), hydrogen peroxide (H_2O_2), singlet oxygen (O_2), nitric oxide (NO^*), peroxy nitrite ($ONOO^*$), and hypochlorous acid ($HOCl$) [3]. Reactive oxygen species (ROS) are a class of highly reactive molecule derived from the metabolism of oxygen. ROS, including superoxide radicals, hydroxyl radical and hydrogen peroxide molecule, are often generated as by product of biological reactions or from exogenous factors. There is extensive evidence to implicate ROS in the development of degenerative diseases [23]. Antioxidant compounds usually contain phenolic compounds, antioxidant activity becomes much higher if the hydroxy group is substituted on the aromatic compound nucleus. Phenolic compounds in plants that show anti-free radical activity is a flavonoid compound, stilben, anthraquinone, phenyl propanoid, Santon and also alkaloids [10]. Currently more natural antioxidants be an option, because of concerns over side effects and toxic properties of synthetic antioxidants, such as carcinogenesis

The process of formation of free radicals in the human body through the events of cell metabolism and the presence of free radicals in the body can be controlled by the body itself by forming an endogenous antioxidant. But the body does not have excessive antioxidant defense system so that the body requires exogenous antioxidants, which are widely available in plants such as vitamin E, vitamin C, carotenoids [25]. There is overwhelming evidence showing that natural antioxidants play a role in wellness, health maintenance, and the prevention of the chronic and degenerative diseases. Several antioxidant based formulations have been developed for the treatment of diseases like atherosclerosis, stroke, diabetes, Alzheimer's disease and cancer during the last 3 decades [23]. This has attracted a great deal of research interest in natural antioxidants. It is necessary to study the botanicals to screen out for their antioxidant potential. Natural antioxidants can protect the human body from free radicals and retard the progress of many chronic diseases as well as lipid oxidative rancidity in foods. Hence, the studies on natural antioxidants have gained increasingly greater importance [9].

In 2002 had done the research to test the antioxidant in some parts of the plant *C. fistula* using the TEAC (Trolox equivalent antioxidant capacity) and FRAP method (Ferric reducing antioxidant power), it was reported that the order of the antioxidant properties of ethanol extract of *C. fistula* from various parts of the plant is the bark > leaves> flowers> pulp [18][24]. From the literature search, we recognized that *C. fistula* is known as plant which possesses medicinal properties useful in the treatment. In the literature search, we further recognize that the highest antioxidant properties exist in the stem bark. Based on this, we conducted research on the antioxidant properties of bark extracts *C. fistula* using a variety of solvents which are non-polar to polar, namely normal-hexane, ethyl acetate and methanol. In our research, we tested the antioxidant activity of each extract in *C. fistula* bark using the FTC method (Ferric thiocyanate).

MATERIALS AND METHODS

Collection of Plant Materials

The fresh stem bark of *Cassia fistula* Linn plants was collected from Purwadadi, Pasuruan district, East Java in February 2009 and we have confirmed the authenticity of the plants from the Botanical Gardens Purwadadi, Indonesia.

Preparation of Plant Extract

C. fistula stem bark collected washed then dried by aerating at room temperature (30 ° C) for several days. Dried stem bark crushed in an electric grinder by using 2kg dry powder and then extracted (maceration) in stages, starting from the non-polar solvent to polar solvent. Plant samples were extracted in a row during 3x24jam up to 3x, ranging from normal hexane (to extract non-polar compounds), ethyl acetate (to extract the semi-polar compounds) and methanol (to extract polar compounds). Solvent in each extract was vacuum evaporated with a rotary evaporator.

Chemical compound

Solvents used for maceration were high quality technical materials that had been distilled first, namely n-hexane, ethyl acetate and methanol. The materials used for this analysis are those with proanalysis (pa) degree and obtained from Merck (Darmstadt, Germany), namely linoleic acid, tween-40, phosphate buffer, methanol, ammonium thiocyanate, ferrous chloride, hydrochloric acid, ethanol.

Antioxidant activity by linoleic acid peroxidation method

Antioxidant activity of stem bark extracts *C. fistula* with various solvents were determined using ferric thiocyanate method [14]. Ferric thiocyanate method (FTC) is based on the determination of peroxide (lipid) at the primary stage of linoleic acid peroxidation. The peroxide reacts with ferrous chloride to form a reddish ferric chloride pigment which is measured at 500nm.

The linoleic acid emulsion was prepared by homogenizing 0.28 g of linoleic acid, 0.28 g of tween-40 as emulsifier and 50 ml of phosphate buffer (0.2 M, pH 7.0).

Each extract was dissolved in methanol and pipette (0.5 ml) into different test tubes (equivalent to 100 ppm), then they were mixed with 2.5 ml of linoleic acid emulsion, 2.5 ml of phosphate buffer (0.2 M, pH 7.0) and incubated at 37^o C for 5 h. The mixture prepared as above, without test sample, was served as control. Aliquots (0.1 ml) were drawn from the incubation mixture at intervals of 1 h and were mixed with 5.0 ml of 75% ethanol, 0.1 ml of 30% ammonium thiocyanate and 0.1 ml of 20 mM in ferrous chloride in 3.5% hydrochloric acid and allowed to stand at room temperature for 3 min. The colour developed was measured at 500 nm. The degree of linoleic acid peroxidation was calculated at 5 h using the following formula [21].

Antioxidant activity = $[1 - (\text{increase in absorbance of sample} / \text{increase in absorbance of control})] \cdot 100$.

The control and the standard were subjected to the same procedure as the sample except that for the control, only the solvent was used, and for the standard, 0.5 ml (equivalent 100 ppm), of the sample was replaced by 0.5 ml (equivalent 100 ppm) of 2,6-di-t-butyl-4-metilfenol (BHT). BHT was used as standard for comparison. All tests and analyses were carried out in triplicate and averaged.

Preparation of standard curve of total phenolic

The total phenol content of plant extracts was determined by Folin-Ciocalteu reagent (FCR) according to the procedure reported by Singleton, Orthofer, and Lamuela Raventos (1999) with some modifications. Into the respective solution of pure phenolic compounds (Afzelechin) in ethanol with the concentration variation of 0.04: 0.05: 0.06: 0.08, and 0.1 mg / mL plus as many as one mL each with 7, 5 mL of Folin Ciocalteu Reagent (FCR), which was diluted 10-fold with distilled water. After standing at room temperature for 5 min, 7.5 ml of 60 mg/ml of aqueous Na₂CO₃ solution were added. The mixture was kept at room temperature for 2 h and then the absorbance was measured at 725 nm. The results were expressed in afzelechin equivalents, determined utilizing a separately prepared absorbance versus concentration curve for afzelechin [8].

Determination of total phenolic content

C. fistula stem bark extract as much as 0.1 mg dissolved in 1 mL of ethanol. Further into the extract solution was added 7.5 mL of Folin Ciocalteu Reagent (FCR), which has been diluted 10 times with distilled water. After 5 minutes add 7.5 mL of Na₂CO₃ solution of 60 mg / mL, the mixture was shaken on a shaker, allowed to stand for 2 hours, then measured the absorbance at a wavelength of 725 nm. All tests and analyzes carried out in triplicate and averaged.

RESULTS AND DISCUSSIONS

In FTC method, the amount of peroxide at the initial stage of lipid peroxidation was determined. During the linoleic acid oxidation, peroxides are formed, which oxidize Fe⁺² to Fe⁺³. The formed Fe⁺³ ions complexes with thiocyanate ions (SCN⁻), which has a maximum absorbance at 500 nm. The concentration of peroxide decreases as the antioxidant activity increases. The lower the absorbance value exhibited, the higher the antioxidant activity.

The antioxidant activities of extract from stem bark *C. fistula* the peroxidation of linoleic acid, as measured by thiocyanate method, are shown in Fig. 1. Absorbance of control increased from 1.0591 to 1.1136 at 3 hours, and then decreased to 0.8882. This is due to oxidation of linoleic acid, generating linoleic acid hydroperoxides, which leads to many secondary oxidation products [13]. 2,6-di-t-butyl-4-metilfenol (BHT) showed an initial absorbance of 0.023 and a maximum absorbance of 0.045 on hour 5. Extract ethyl acetat had absorbance value of 0.3724 initially and gradually raised to 0.3021 on hour 5. The control had the highest absorbance value 0.8882, followed by hexane extract (0.5981), methanol extract (0.3713), ethyl acetate extract (0.3021) on hour 5. Based on the results obtained, the ethyl acetate extract was found to possess antioxidant activity, which is comparable to standard 2,6-di-t-butyl-4-metilfenol (BHT), at a concentration of 100ppm.

The oxidized products (i.e. linoleic acid hydroperoxides) react with ferrous chloride to form ferric chloride, then to ferric thiocyanate (blood-red colour) [13]. After the incubation period (3 h), the formation of peroxides is stagnated, due to non-availability of linoleic acid. Also, the intermediate products may be converted to stable end-products. The non-availability of hydroperoxides, results in the retardation of oxidation of ferrous chloride. Hence, the absorbance does not increase. In the presence of extract hexane, ethyl acetate extract, methanol extract and BHT, oxidation of linoleic acid was very slow. Hence, the colour development is slow. The antioxidant activities of the extract of each extract, are shown in Fig. 2., for hexane extract (Hx), ethyl acetate extract (Ea), methanol extract (MeOH) to be 37.45%, 70.04% and 66.24%, respectively, at 3 h; and we found the data of 32.66%, 65.98% and 58.19%, respectively, at 5 h. Those data are equivalent to (100 ppm) BHT as a standard synthetic antioxidant that in 5 hours can cause 95.7% inhibition of linoleic acid peroxidation. In brief, total antioxidant activity of *C.fistula* stem bark extract and positive control are determined by FTC method decreased in the order of BHT > Ea > MeOH > Hx.

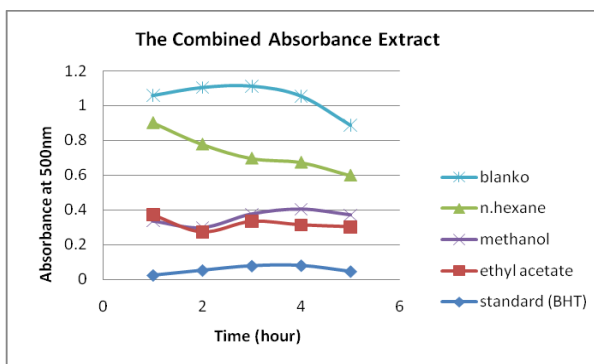


Fig. 1. Absorbance at 500nm of *C.fistula* stem bark extracts, standard antioxidant compound BHT at the concentration of 100 ppm and blanko (BHT: 2,6-di-t-butyl-4-metilfenol). Absorbance at 500nm determined by ferric thiocyanate method (FTC). A low absorbance value represents a high level of antioxidant activity. Values are the average of triplicate experiments.

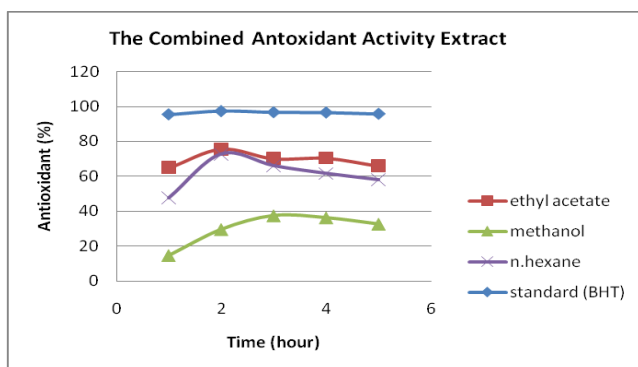


Figure 2. Antioxidant activity of *C.fistula* stem bark extracts at 100 ppm and standard antioxidant compound BHT at the concentration of 100 ppm (BHT: 2,6-di-t-butyl-4-metilfenol). Antioxidant activity determined by ferric thiocyanate method (FTC). Values are the average of triplicate experiments.

The present study reveals that ethyl acetat extract from stem bark *C. fistula* showed antioxidant property which is comparable to the standard BHT. Thus ethyl acetat extract exhibited significant *in vitro* antioxidant activity by inhibiting the oxidation of linoleic acid in FTC method. The activity was comparable with standard BHT .

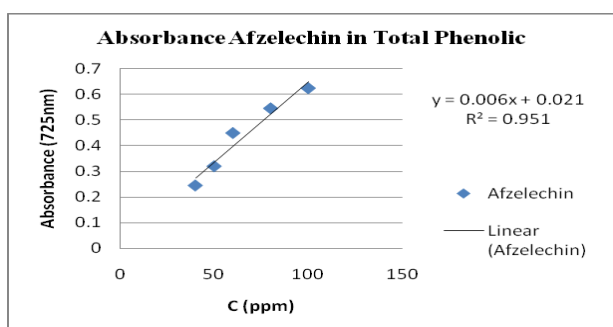


Figure 3. The curve linear relationship between absorbance with concentration afzelechin as a standard test of total phenolic. The regression equation obtained from the calibration curve : $y = 0.006x + 0.021$; $R^2 = 0.951$.

Antioxidant compounds generally contain phenolic group, while extracts are mixture of dozens of compounds with different functional groups, polarity, and chemical behavior. A thorough phenol test is needed to gain further information on the total phenol content of each extract as antioxidants.

A specific reagent of Folin-Ciocalteu reagent (FCR) is used for the early detection of the content of total phenolic compounds in a sample Folin-Ciocalteu reagent is a reagent that has been developed to determine the total phenolic content in a sample of natural material. This reagent is a mixture of [phosphomolybdate](#) and [phosphotungstate](#) used to analyze phenolic compounds by measuring the ability of test compounds to inhibit the oxidation of the reactants. The principle of this test is the reaction of reduction events Mo (VI) to Mo (V) by a component of antioxidants such as phenolic compounds. Complex Mo (V) is formed which can be detected by UV-Vis spectrophotometry [20].

The assay to determine the total phenolics content employs Folin and Ciocalteu’s phenol reagent in which the result will depend on the chemical structure of phenolics (i.e. the higher the number of functional – OH group the higher the total phenolics content) [15]. Therefore afzelechin was used as the standard to represent all phenolics present in *C. fistula* extracts. Fig. 3 exhibits afzelechin equivalents of total phenolic contents of all extracts. As displayed, ethyl acetate extract carried highest total phenolics and the rest of the extracts followed the order of Ea > MeOH > Hx.

Table 1. Total phenolic contents of extracts calculated from regression equation of calibration curve ($A_{725nm} = 0.006[C_x]mg + 0.021$). Figure 1 through 3 shows a positive relationship exists between the antioxidant activity of each extract as measured by the FTC method and total phenolic content of extracts.

TABLE I
Total phenol in *C.fistula* extract

Extract	C (ppm)	A (at 725nm)	Total Phenol (mg)
Afzelechin	100	0.6166	99.2667
HX	100	0.0656	7.433333
Ea	100	1.0863	177.55
MeOH	100	0.7603	123.2167

The decreasing order of antioxidant activities in extracts of the stem bark *C.fistula* correlates well with the order of antioxidant capacities found by content of phenolic compounds obtained from measurements total phenolic of each extract.

CONCLUSIONS

This study revealed that stem bark extracts *C.fistula* has the potential to inhibit the oxidation of linoleic acid *in vitro*. Ethyl acetate extract showed significant antioxidant activity *in vitro* by inhibiting the oxidation of linoleic acid in the ferric thiocyanate method (FTC). The antioxidant activity of ethyl

acetate extract of stem bark *C.fistula* is comparable with standard 2,6-di-*t*-butyl-4-metilfenol (BHT) antioxidant activity. This information, may be useful in drug design and clinical use of antioxidants. Nonetheless, further test on the stem bark *C.fistula* extract is needed to support the feasibility of its use in clinical utilization as an antioxidant. Therefore, the expected outcome of this research could encourage other similar research in the effort of finding the marker compound (chemical marker) for antioxidants as a lipid peroxide.

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TITLE **Antioxidant Activities of Extracts of Trengguli Stem Bark (Cassia fistula L.)**

AUTHOR(S) Noorhajati, Hermien; Tanjung, Mulyadi; Aminah, Nanik Siti; Suwandi, J. S. Ami

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ABSTRACT This research is conducted to examine the antioxidant activity on the extract of stem bark *C.fistula*. The antioxidant activities of *C.fistula* stem bark extract were tested with lipid peroxides test using ferric thiocyanat method (FTC) and 2,2,2-azobis(isobutyronitrile) (AIBN) as standard equivalent antioxidant capacity. *C.fistula* stem bark was macerated successively used solvent normal heksane (non polar), ethyl acetate (semi polar) and methanol (polar). The ethyl acetate extract (Ea) shows higher antioxidant activity than the n.hexane extract (Hx) and methanol extract (MeOH). Therefore, the sequence of antioxidant activity is as follows ethyl acetate extract > methanol extract > n.hexane extract, with antioxidant activity consecutively at 5 hours: 65.98%, 58.19% and 32.66%. Those amount are equivalent to the standard synthetic antioxidant BHT (100 ppm), which causes 95.7% antioxidant activity (in 5 hours) inhibition of linoleic acid peroxidation. There is a connection between antioxidant activity of an extract with the content of the total phenol in each extract. From the assay of phenolic extracts with the method of Folin-Ciocalteu reagent (FCR) and also using afzelechin standard as a comparison, we find that the ethyl acetate extract has the highest total phenolic where the entire sequences are as follows: Ea> MeOH> Hx. with total phenol content consecutive 177.55, 123.2167, 7.433333.

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The antioxidant activity of hexane, ethyl acetate and methanol extracts of *Illicium griffithii* (*I. griffithii*, Family: Schisandraceae) seeds were determined using 1,1-diphenyl-2-picrylhydrazyl (DPPH), phosphomolybdenum, cupric ions (Cu²⁺) reducing antioxidant capacity (CUPRAC), ferric reducing...

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In this study, we estimated the antioxidant activity of various extracts prepared from *Artemisia campestris* L. aerial parts used in

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Algeria to treat gastro-intestinal disorders. The determination of polyphenols and flavonoids contents showed that the ethyl acetate extract (EAE) is rich in...

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[HPLC Analysis of Phenolics Compounds and Antioxidant Capacity of Leaves of *Vitex megapotamica* \(Sprengel\)](#)

[Moldenke](#). ([/c/articles/89428997/hplc-analysis-phenolics-compounds-antioxidant-capacity-leaves-vitex-megapotamica-sprengel-moldenke](#)). de Brum, Thiele Faccim; Zadra, Marina; Piana, Mariana; Augusti Boligon, Aline; Kieling Fröhlich, Janaina; de Freitas, Robson Borba; Terra Stefanello, Silvio; Forbrig Froeder, Amanda Luana; Belke, Bianca Vargas; Teixeira Nunes, Letícia; da Silva Jesus, Roberta; Mansur Machado, Michel; Teixeira da Rocha, João Batista; Antunes Soares, Félix Alexandre; Linde Athayde, Margareth // *Molecules*; Jul2013, Vol. 18 Issue 7, p8342

Vitex megapotamica (Sprengel) Moldenke belongs to the Verbenaceae family and is popularly known as "tarumã". The antioxidant capacity of fractions and crude extract from the leaves of *V. megapotamica* were determined in this study through the capacity to remove reactive species and phenolic...

[Characterization and Antioxidant Properties of Six Algerian Propolis Extracts: Ethyl Acetate Extracts Inhibit Myeloperoxidase Activity](#). ([/c/articles/94703433/characterization-antioxidant-properties-six-algerian-propolis-extracts-ethyl-acetate-extracts-inhibit-myeloperoxidase-activity](#)). Boufadi, Yasmina Mokhtaria; Soubhye, Jalal; Riazi, Ali; Rousseau, Alexandre;

Vanhaeverbeek, Michel; Nève, Jean; Boudjeltia, Karim Zouaoui; Van Antwerpen, Pierre // *International Journal of Molecular Sciences*; Feb2014, Vol. 15 Issue 2, p2327

Because propolis contains many types of antioxidant compounds such as polyphenols and flavonoids, it can be useful in preventing oxidative damages. Ethyl acetate extracts of propolis from several Algerian regions show high activity by scavenging free radicals, preventing lipid peroxidation and...

[Antioxidant Activity of the Bulb and Aerial Parts of *Ornithogalum sintenisii* L. \(Liliaceae\) at Flowering Stage](#).

([/c/articles/49314252/antioxidant-activity-bulb-aerial-parts-ornithogalum-sintenisii-liliaceae-flowering-stage](#)). Ebrahimzadeh, Mohammad Ali; Nabavi, Seyed Mohammad; Nabavi, Seyed Fazel; Eslami, Bahman // *Tropical Journal of Pharmaceutical Research*; Apr2010, Vol. 9 Issue 2, p141

Purpose: *Ornithogalum sintenisii* is an Iranian species with little known about its pharmacological effects. The purpose of the present study was to investigate some antioxidant properties of the plant. Methods: The antioxidant potency of the freeze-dried methanol extract of *O. sintenisii* bulbs...

[EVALUATION OF THE ANTIOXIDANT ACTIVITY OF RED WINES IN RELATIONSHIP TO THEIR PHENOLIC CONTENT](#).

([/c/articles/19389875/evaluation-antioxidant-activity-red-wines-relationship-their-phenolic-content](#)). Giovanelli, G. // *Italian Journal of Food Science*; 2005, Vol. 17 Issue 4, p381

The antioxidant activity of 20 red wines (12 young wines and 7 one-year-old wines) was measured by two in vitro assays: the inhibition of coupled oxidation of β -carotene/linoleic acid mixture and the free radical scavenger activity using 2,2-diphenyl-1-picrylhydrazyl (DPPH*). Total phenolics,...

[Investigating Inhibitory Effects of *Punica granatum* Fruit Extracts on Lipid Peroxidation in the Fenton Reagent Environment](#). ([/c/articles/75244228/investigating-inhibitory-effects-punica-granatum-fruit-extracts-lipid-peroxidation-fenton-reagent-environment](#))

Ozshahin, Ayse Dilek; Kirecci, Oguz Ayhan; Yilmaz, Okkes; Erden, Yavuz; Bircan, Burak; Karaboga, Zeynep // *Asian Journal of Chemistry*; 2012, Vol. 24 Issue 3, p1010

In this study, it is aimed to find antioxidant activity of methanolic extract of *Punica granatum* fruit, by determining β -carotene/linoleic acid mixture and the free radical scavenger activity using 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging property and also by determining the capacity to prevent the formation of lipid peroxidation which is found in...

[Free Radical-scavenging Potential of Methanol Extracts of *Solarium surattense*](#). ([/c/articles/97718528/free-radical-scavenging-potential-methanol-extracts-solarium-surattense](#))

Yadav, Ankita; Bhardwaj, Richa; Joshi, Y. C.; Sharma, R. A. // *Research Journal of Phytochemistry*; 12/1/2014, Vol. 8 Issue 4, p139

Natural products from plants provide unlimited opportunities for discovery of new drugs. The present study was aimed to evaluate the total phenolic content, total flavonoids content and their influence on different antioxidant activities. The antioxidant activity was evaluated by Ferric Reducing...


[Antioxidant Activity and Total Phenolic Contents in Leaf of some Thai Rice Cultivars](#). ([/c/articles/74697062/antioxidant-activity-total-phenolic-contents-leaf-some-thai-rice-cultivars](#))

Jiraporn Krasaetep; Muntana Nakornriab; Duranee Puangpronpitag // *International Journal of Applied Chemistry*; 2011, Vol. 7 Issue 3, p285

The methanolic extracts in each growth stage (tillering, panicle initiation, booting, milking, and maturation stage) from 14 kinds of Thai leaf rice cultivars (white, red, and black rice) are studied for their antioxidative activities and total phenolic contents. The total phenolic content of...

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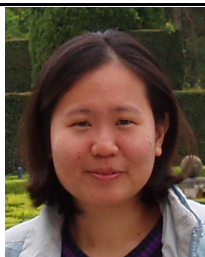

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Title: Lithostratigraphy, Microfacies Succession, Sequence Stratigraphy And Depositional Environment Of The New Netim Formation, Calabar Flank, South Eastern Nigeria
Author(s): Nse U. Essien, Edoho D. Bassey

Pages: 06-19

Paper ID: 120404-8585-IJBAS-IJENS

Published: August, 2012

Abstract: The New Netim Formation located in the Calabar Flank, South Eastern Nigeria is made dominantly of bedded / nodular marlstones interbedded with thin beds of shales. In the Calabar Flank, this marl unit forms extensive ridges and hills from the Mbebu village in the Southeast to Ikot Nyong in the Northeast. This carbonate build up is being investigated to elucidate its lithostratigraphy, microfacies, sequence stratigraphy and depositional environment. Being located between the Gulf of Guinea and the Aptian Salt Basins in the South Atlantic, this study will give a clue on the rhythms of the Coniacian transgression in the South Atlantic. Carbonate analysis reveal the predominance of three major microfacies type, which recur continuously both vertical and horizontally. The identified microfacies types are: biomicritic mudstone – wackestone, micritic mudstone and pelmicritic mudstone microfacies. Sequence stratigraphic analysis based on inferred sea level changes, shows that the marl unit is an aggradational sequence stratigraphic unit with continuous “pendulimic” fluctuations in sea levels between shallow and deep marine environment during the Coniacian transgression in the South Atlantic. This is evident by monotonous repetition and similarity of facies composition in each successive parasequence with relatively minor facies shift and no clear long term trend. Inferred depositional environment based on microfacies and sequence stratigraphic interpretations indicate deposition in a low energy, lagoonal / protected bay environment with continuous and repetitive sea level changes between shallow and deep marine.

Keywords: Lithostratigraphy, carbonate microfacies, depositional environment, sequence stratigraphy, New Netim Formation, Marlstones

[Full Text \(.pdf\)](#) | 16617 KB

Title: Optimal Urinating Position in Function of Urinary Tract Diseases
Author(s): Fikret Veljovic

Pages: 20-24

Paper ID: 120504-6767-IJBAS-IJENS

Published: August, 2012

Abstract: We analyzed three urinary positions (standing, seating and squatting) through mathematical model and real condition of tested subjects, and concluded that male subjects has the biggest bladder discharge in squatting position. With new recommended habits for bladder discharge, the number of urinary tract infections is decreased.

Keywords: Biomechanics, ergonomics, bladder anatomy, urinary tract infections, intraabdominal pressure

[Full Text \(.pdf\)](#) | 1715 KB

Title: Discontinuous Quantum Stochastic Differential Equations And The Associated Kurzweil Equations
Author(s): S. A. Bishop

Pages: 25-31

Paper ID: 1210603-04-4848-IJBAS-IJENS

Published: August, 2012

Abstract: Quantum stochastic differential equations (QSDEs) of systems that exhibit discontinuity are introduced with the Kurzweil equations associated with this class of equations. The formulations are simple extensions of the methods applied by Schwabik [10] to ODEs to this present noncommutative quantum setting. Here the solutions of a QSDE are discontinuous functions of bounded variation that is they have the same properties as the Kurzweil equations associated with QSDEs introduced in [1].

Keywords: QSDE; Impulsive; Kurzweil equations; Lebesgue Stieltjes measures; Discontinuous Noncommutative stochastic processes

[Full Text \(.pdf\)](#) | 7755 KB

Title: Improvement of Fertilizer N Recovery by Allocating More N for Later Application in Cotton (*Gossypium hirsutum* L.)
Author(s): Tang Hao-yue, Yang Guo-zheng, Zhang Xian-long, Siddique Kadambot

Pages: 32-37

Paper ID: 121904-4848-IJBAS-IJENS

Published: August, 2012

Abstract: In the Yangtze River Valley in China, 300 kg N/ha is normally applied to cotton crops in three splits: pre-plant application (PPA, 30%), first bloom application (FBA, 40%) and peak bloom application (PBA, 30%). However, low plant fertilizer N recovery (FNR) (30–35%) was accompanied with the negative effects on the environment. Two-year field trial has proven the feasibility of obtaining the same cotton yield by allocating more N for later application (PBA) with lower N rate. A pot experiment was carried out to testify if there was any improvement in N absorption and FNR in cotton (*Gossypium hirsutum* L. cv Huazamian H318) plants by fixing 40% of 225 kg 15N/ha for FBA. The results showed that both total N and fertilizer 15N accumulation in cotton plants responded positively to N split ratio resulting in a (curve) meeting point at 80 DAE (days after emergence). The total N and fertilizer 15N amount (mg/plant) increased from 1526 and 1194 to 2143 and 1924, respectively, as the ratio of N allocated to PBA increased from 20% (N42) to 60% (N06). Cotton plants absorbed N the most during flowering, but N06 had the highest 15N uptake rate (mg/plant/d) (33) during boll setting, which was almost the same as that during flowering; whereas N42 dropped drastically to 5 from 38. Total FNR (plant and soil) increased greatly from 54% (N42) to 88% (N06). It suggests that allocating N fertilizer from PPA to PBA would ensure faster accumulation of fertilizer N during boll setting, and benefit the improvement in FNR.

Keywords: Cotton (*G. hirsutum* L.); N later application; fertilizer N recovery (FNR); split ratio

[Full Text \(.pdf\)](#) | 819 KB

Title: Influence of Sawdust Size and Ratio of HDPE Waste on the Physical Properties of Wood-Plastics Composite

Author(s): Endra Gunawan, Anom Indra Adhyaksa, Reinardus L. Cabuy

Pages: 38-42

Paper ID: 122204-5757-IJBAS-IJENS

Published: August, 2012

Abstract: This study investigated influence of wood-dust from three types of wood waste that are *Intsia bijuga*, *Pometia* sp. and mixed-wood from local timber industries with the ratio of plastic adhesive waste or *high density poliethylena* (HDPE). Apart of that, the research would like to find out the possibility in using such a waste as a particle board material by identified the mechanical property which includes moisture content, density, water absorption and thickness swelling in 2 and 24 hours submersions. The activity carried out at the forest product laboratory and wood processing the state university of Papua. Method used is descriptive by experimental observation. Result exhibit that combination between wood dust and recycled plastic adhesive has potentially used for raw material particle board. Moisture content of particle board ranging between 3.9651% at Ma 80 (40%) up to 7.1100% at Ca 60 (20%) and thus has met the Japan Standard (JIS) A 5908 (2003) wherein < 13%. The density ranged from 0.9304 gr/cm³ at Ma 80 (20%) up to 1.0843 gr/cm³ at Ma 60 (30%) by which the results exceeding the expected target of 0.9 gr/cm³ based on JIS standard and 0.7 gr/cm³ at the Indonesia standard. Swelling property of plasticboard in 2 hours submersion ranging between 5.7420% at Ma 80 (40%) up to 25.5757% at Ca 60 (20%). Whereas in 24 hours submersion ranging of 7.5675% at Ma 80 (30%) up to 28.5305% at Ca 60 (20%). Relatively the thickness swelling of plasticboard has not met the required standards of a maximum of 12% for JIS A 5908 (2003).

Keywords: High density poliethylena, plasticboard, wood-sawdust

[Full Text \(.pdf\)](#) | 103 KB

Title: The Role of Dielectric Constant in Fractional Separation of Alkali Metals Salts from Aqueous Solutions

Author(s): Mutasim I. Khalil, Reem A.H.Al-Yami, Amani H.Al-Khabbas

Pages: 43-46

Paper ID: 123704-8989-IJBAS-IJENS

Published: August, 2012

Abstract: The effect of dielectric constant (ϵ) on the precipitation of Lithium, Sodium and Potassium chlorides has been investigated. At $\epsilon \approx 35$, 100%KCl, 58% NaCl, and 0.0%LiCl is separated from an aqueous solution mixture. Repeated procedures at selected dielectric constants achieved complete fractional separation of the three salts. Results are correlated to dielectric constant, cation size and hydration energies.

Keywords: Alkali metals chlorides, Fractional separation, Dielectric constant, Desalination, Cation size, Hydration energy

[Full Text \(.pdf\)](#) | 198 KB

Title: Daily Activity Budget of Long-tailed Macaques (*Macaca fascicularis*) in Kuala Selangor Nature Park

Author(s): Kamarul Hambali, Ahmad Ismail, Badrul Munir Md-Zain

Pages: 47-52

Paper ID: 124404-6767-IJBAS-IJENS

Published: August, 2012

Abstract: Long-tailed macaques (*Macaca fascicularis*) are widely distributed animals around the world that require special attention from the research and management perspectives. Daily activity budget of *M. fascicularis* were studied near the Kuala Selangor Nature Park as one part of study on its behavior and ecology. The study location was based along the *M. fascicularis* trails starting from the ticket counter of the local train station to the main entrance of KSNP and their daily activity budget were studied from February 2011 until July 2011 inclusive of intensive direct observation using the scanning method. Observations revealed that long-tailed macaques use most of the their time for moving (20.27%), followed by feeding (18.78%), being inactive (17.05%), grooming (10.84%), playing (10.50%), vocalization (10.36%), mating (7.42%) and the last is fighting (4.78%). Qualitative results found that the interaction between the long-tailed macaques group with silvered-leaf monkeys are fighting and grabbing food. The long-tailed macaques also cause disruption in this area such as disturbing the visitors. There is a strange behavior that is rarely seen which is mating behavior between the long-tailed macaque with a cat that was found in the study area. Chi-square test demonstrated that daily activity budget differed significantly among the behaviors.

Keywords: Daily activity budget, long-tailed macaque, *Macaca fascicularis*, Kuala Selangor Nature Park, Peninsular Malaysia

[Full Text \(.pdf\)](#) | 15052 KB

Title: New Types of Transitive Functions and Minimal Systems

Author(s): Mohammed Nokhas Murad

Pages: 53-58

Paper ID: 121204-5858-IJBAS-IJENS

Published: August, 2012

Abstract: The purpose of this paper is to give new types of topological b-transitive functions and new types of b-minimal functions. We obtain their characterizations and investigate some of its properties. The main results are the following propositions:

1. Every topologically b-transitive function is a topological transitive function as every open set is b-open set but the converse not necessarily true.
2. Every b--minimal function is a minimal function as every open set is b- open set, but the converse not necessarily true.

Keywords: Topologically b- transitive, b- minimal functions, b- continuous, b- irresolute

[Full Text \(.pdf\)](#) | 228 KB

Title: Serum Levels of Male Oligospermia Glycoconjugate Inhibin B hormone and α -L-Fucose in Kurdistan (Iraq) populations

Author(s): Govand Ali Ahmed, Hamid Ghaffoori Hasan, Aso Omer Rashid

Pages: 59-66

Paper ID: 124704-5858-IJBAS-IJENS

Published: August, 2012

Abstract: Objectives: To assess the role of inhibin B in the evaluation of male factor infertility as a prospective study. To determine normative levels of inhibin B and examine levels in relationship to FSH, sperm count, and motility in a cohort of fertile and infertile men from the Kurdistan region of Iraq.

Materials & methods: Semen analysis was performed according to World Health Organization guidelines. An ELISA technique were applied for serum levels of inhibin B (ng/L), LH (mIU/L), FSH (mIU/L), and testosterone (ng/ml) assays. A colorimetric procedure was followed for the fucose and protein bound fucose levels determination.

Results: A total of 55 infertile (oligospermia) and 87 presenting for fertility (normal) evaluations were recruited. The mean serum inhibin B level was significantly ($P < 0.05$) lower in the oligospermia (18 ng/L) than normal group (24 ng/L). No significant differences were found in determination levels of fucose in both groups. Serum FSH and LH levels were significantly higher in oligospermia than in normal. Conclusion: Inhibin B levels in fertile men and infertile men in Kurdistan region were similar but not identical to those reported in other geographic regions. Both inhibin B and FSH are useful markers of spermatogenesis.

Keywords: Inhibin B, FSH, LH, fucose, male infertility, spermatogenesis

[Full Text \(.pdf\)](#)  | 282 KB

Title: Evaluation of Serum Chromium Levels in Patients with Type1 and 2 Diabetes Mellitus and insulin resistance

Author(s): Hamid Ghaffoori Hasan, Parween A. Ismael, Nazk Mohammed Aziz

Pages: 69-73

Paper ID: 124804-5656-IJBAS-IJENS

Published: August, 2012

Abstract: Chromium is one of the essential nutrients whose metabolism changes in diabetes. It has been shown that there is a relationship between serum chromium and both kinds of diabetes [non-insulin-dependent diabetes mellitus (NIDDM) and insulin-dependent diabetes mellitus (IDDM)]. The aim of the present study is to investigate the serum chromium (Cr) status (In Type-1 DM patients, Type-2 patients, and insulin resistance. The study was conducted on 50 type-1 DM subjects, 50 type-2 DM subjects, 50 patients with Insulin resistance and 50 control subjects. Glucose, HbA1c and Cr were analyzed in fasting serum of all subjects. Serum chromium (Cr) levels were decreased in all three patients groups, respectively Type-1 DM, Type-2 DM and insulin resistance group ($p < 0.05$, $p = 0.001$, $p < 0.001$). There were strong negative correlation between serum Cr and HbA1C levels respectively (Type-1 DM patients, Type-2 DM patients, insulin resistance) ($r = -0.67$, $p < 0.05$) ($r = -0.75$, $p < 0.05$) ($r = -0.64$, $p < 0.05$).

Keywords: Serum Chromium, Type-1 and 2 DM, Insulin resistance

[Full Text \(.pdf\)](#)  | 140 KB

Title: A Review on Prominent Techniques on the Determination of Colloidal Particle Surface Charge

Author(s): Suparno

Pages: 74-78

Paper ID: 129504-8585-IJBAS-IJENS

Published: August, 2012

Abstract: A device being capable of measuring particle surface charge has not been found yet. Therefore, no one is able to measure particle charge directly. A well known ammeter is only able to measure electric current, but not charge. Most physics students and teachers have not understood how to determine the particle surface charge. Fortunately, there are several techniques which can be used to determine the particle charge, yet they have not been incorporated into Indonesian physics books and curriculum. The basic technique to determine the particle surface charge is called electrophoresis. This technique was then developed to become Laser Doppler Electrophoresis (LDE) by exploring the fact that the frequency beat of the Doppler Effect is related to the velocity of the particle which was then used to determine the particle charge. On the other hand, a more sophisticated technique called Phase Analysis Light Scattering (PALS) explores the relationship between phase shift of the scattered light and the velocity of the particle to determine particle charge. The above three techniques are summarized in this paper.

Keywords: Electrophoresis, Laser Doppler Electrophoresis (LDE), Phase Analysis Light Scattering (PALS)

[Full Text \(.pdf\)](#)  | 233 KB

Title: Existence and uniqueness solution of an inverse problems for degenerate differential equations

Author(s): Mahmoud M. El-borai, Osama L. Mostafa, Hoda A. Fouad

Pages: 79-84

Paper ID: 1211204-0707-IJBAS-IJENS

Published: August, 2012

Abstract: In this paper we concerned with study existence and uniqueness of solutions for a class of inverse problems of degenerate differential equations. The main tool perturbation theory for linear operators. Consider the inverse problems for degenerate differential equations of the form

$$dBu(t)/dt = Au(t) + B\chi(t)f(t);$$

with the initial condition

$$u(0) = u_0$$

and the overdetermination condition

$$(u(t); v) = w(t)$$

where A and B are closed linear operators in a Hilbert space H, f is a given abstract function with values in H, v is a given element in H, u_0 is an initial value, and $\{u, \chi\}$ are the unknown functions.

Keywords: Perturbation Theory of Linear Operators; Linear C_0 - Semigroup ; degenerate differential equations

[Full Text \(.pdf\)](#) | 1657 KB

Title: **Antioxidant Activities of Extracts of Trengguli Stem Bark (*Cassia fistula* L.)**

Author(s): Hermien Noorhajati, Mulyadi Tanjung, Nanik Siti Aminah, Ami Suwandi J.S.

Pages: 85-89

Paper ID: 129404-1717-IJBAS-IJENS

Published: August, 2012

Abstract: This research is conducted to examine the antioxidant activity on the extract of stem bark *C.fistula*. The antioxidant activities of *C.fistula* stem bark extract were evaluated with lipid peroxides test using ferric thiosyanat method (FTC) and 2,6-di-t-butyl-4-metilfenol (BHT) as standard equivalent antioxidant capacity. *C.fistula* stem bark maceration successively used solvent normal heksane (non polar), ethyl acetate (semi-polar) and methanol (polar). The etyl acetate extract (Ea) shows higher antioxidant activity than the n.hexane extract (Hx) and methanol extract (MeOH). Therefore, the sequence of antioxidant activity is as follows ethyl acetate extract > methanol extract > n.hexane extract, with antioxidant activity consecutively at 5 hours: 65.98%, 58.19% and 32.66%. Those amount are equivalent to the standard synthetic antioxidant BHT (100 ppm), which causes 95.7% antioxidant activity (in 5 hours) inhibition of linoleic acid peroxidation. There is a connection between antioxidant activity of an extract with the content of the total phenol in each extract. From the assay of phenolic extracts with the method of Folin-Ciocalteu reagent (FCR) and also using afzelechin standard as a comparision, we find that the ethyl acetate extract has the highest total phenolic where the entire sequences are as follows: Ea> MeOH> Hx. with total phenol content consecutive 177.55, 123.2167, 7.433333.

Keywords: *Cassia fistula*, Antioxidant, Lipid peroxide, Total Phenolic

[Full Text \(.pdf\)](#) | 159 KB

Title: **Isolation of Artemisinin as Antimalarial Drugs from *Artemisia annua* L. Cultivated in Indonesia**

Author(s): Deliana Dahnum, Haznan Abimanyu, Ahmad Senjaya

Pages: 90-95

Paper ID: 1211704-4545-IJBAS-IJENS

Published: August, 2012

Abstract: Malaria disease is endemic in developing countries like Indonesia. This disease is caused by protozoa of the genus Plasmodium infection that is easily recognizable from the symptoms of prolonged fever. Some of the methods taken to stop spread of this disease. Artemisinin is a sesquiterpene lactone found in the leaves and flowers of plants *Artemisia annua* L and have different chemical structures and higher efficacy than others. *Artemisia annua* L. is originated from subtropical and can be introduced into the tropics such as Indonesia. The content of artemisinin itself is very small at around 0.01 to 1.4% of dry weight of plants. The first step in this research is solvent extraction using methanol. Step followed by partition using hexane and column chromatographic separation process with ethyl acetate / hexane as eluent. Isolates were characterized using TLC, FTIR, UV spectrophotometer, and HNMR spectroscopy. Through the process is obtained S4 as a result of isolation hexane fraction which has a character similar to artemisinin with 2.0 mg (0.016% w / w).

Keywords: Artemisinin, *Artemisia annua* L., malaria, methanol extraction

[Full Text \(.pdf\)](#) | 191 KB

Title: **Inverse Cauchy Problem for some Stochastic Fractional Integro differential equations**

Author(s): Mahmoud M. El-borai, Khairai El-Said El-Nadi, Hanan S. El-Hoety

Pages: 96-101

Paper ID: 1211404-3838-IJBAS-IJENS

Published: August, 2012

Abstract: In this paper we shall study the solution of Cauchy problem in a Hilbert space H for a stochastic fractional integro-differential equations of the form....

Keywords: Inverse Chauchy Problem, Stochastic integro- differential equation, fractional order

[Full Text \(.pdf\)](#) | 745 KB

Title: **Novel Procedure For Minimizing The Emission of Nitrogen Dioxide in Manufacturing of Azote Fertilizer Using ASWAN Bentonite as Filler**

Author(s): Kamal Abou Elmagd, Gharib M. Taha

Pages: 102-107

Paper ID: 1212504-8080-IJBAS-IJENS



Published: August, 2012

Abstract: In one of the natural and green chemistry approach, effective reduction of the emitted nitrogen dioxide (NO₂) was achieved using 20% bentonite as filler through production of ammonium nitrate (AN) fertilizer. Furthermore, this application serves in minimizing the production losses and make the process more eco-friendly. The final product is neutral (pH = 7.36), so it can be used in any type of soil. The new product is identical in grain size and granular form to the usual fertilizer coated with limestone, and does not require any technological modification in the plant systems. Laboratory tests indicate that the emission of NO₂ gas during AN fertilizer manufacturing is effectively decreased with increasing of bentonite filler ratio to about quarter of its original value. Mineralogy and chemical composition of Ca-bentonite were assayed using XRD and XRF techniques. Bentonite reduces the tendency to caking of AN to about 60% and hence, reduces the need for anti-lithification agent during fertilizer manufacturing by the same ratio due to bentonite inflexibility.

Keywords: Ammonium nitrate (AN) fertilizer, bentonite filler, Nile sediments, nitrogen dioxide, slow released fertilizer

[Full Text \(.pdf\)](#) | 446 KB

Title: **Tumoricidal Effect of Photofrin and Nanomaterials in Human Glioblastoma Cell Line**

Author(s): Muhammad Asim –ud-din, Muhammad Fakhar-e-Alam, S. Karim, Z. Wazir, Hajra Sadia, Waqar. A. A. Syed		
Pages: 108-111	Paper ID: 124004-5959-IJBAS-IJENS	Published: August, 2012
Abstract: The uses of Nanoparticles (NPs) and nanorods (NRs) in Photodynamic Therapy (PDT) have tremendous multiple clinical applications in diagnostic as well as antitumor and in many microbial nonmicrobial treatments due to their high quantum yield, size dependent tunable emission of wavelength over wide spectrum of light. ZnO nanorods due to many attractive features might be used as an efficient drug vehicles and its intrinsic and broadband emission spectrum may provide the threshold dose required in cell necrosis mechanism. We have studied the toxicity of different NRs and NPs alone and complex with different photosensitizers (PS) including aminolevulinic acid (ALA) and Photofrin® using human brain cancerous cell lines as an experimental model. Mechanism of cytotoxicity triggers the generations of ROS/singlet oxygen inside the labelled cells. The novel findings of cell apoptotic toxicity indicate a potential application of given iron oxide nanoparticles producing the cytotoxic effects for the suggested cell line. The affectivity of intracellular NRs conjugated PS, systematic drug delivery technique has been introduced in current experiment. Cell viability has been determined by neutral red assay (NRA) and MTT assay, the results has been verified by microscopic analysis (visualization) of cell morphology.		
Keywords: Photodynamic therapy, ZnO nanorods, Photofrin®, Cell Necrosis		
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Abstract: We are all witnesses that the beginning of the 21st century in technological terms is dedicated to mobile communications - they are everywhere: smart phones, iPods, readers, and many other wireless devices. Once a fiction today is a reality – music on demand, video on demand, and live video conversation via IP on a tablet. What will be the next technological achievement that will have such huge impact on human living? I dare to predict that the second half of this century will be highly influenced by mobile robotics – robots will become ubiquitous décor in everyday life.		
Keywords: Technological, Mobile Communication, Human Living, Mobile Robotics		
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