



Theme: Harnessing Biotechnology Potentials for National and Economic Development
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At South East Zonal Biotechnology Research Centre, University of Nigeria, Nsukka



QUALITATIVE ANALYSIS AND DETECTION OF PALM OIL ADULTERATION IN SELECTED PALM OIL PRODUCING STATES IN NIGERIA

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Abstract

Palm oil is most widely used oil, due to its nutritional and economic significance. The evaluation of the physicochemical properties of palm oil is a reliable means of ascertaining its quality and suitability for certain applications. This study was therefore aimed to examine the physicochemical parameters of eight (8) palm oil samples collected from four major producing cities with two samples each collected from each state. Eight physicochemical parameters were analyzed in this study employing standard laboratory methods. The results obtained from the properties analyzed for all the samples had the following ranges: Moisture contents (0.12 ± 0.30 %- 2.13 ± 0.40 %), specific gravities (0.40 ± 0.22 - 0.916 ± 0.002), free fatty acid value (3.70 ± 0.36 % - 22.67 ± 0.16 %), unsaponifiable matter (0.19 ± 0.50 %- 0.70 ± 0.28 %), acid values (7.39 ± 0.36 %- 31.55 ± 0.26 %), iodine values (15.67 ± 0.23 Wijs- 59.22 ± 0.25 Wijs), peroxide values (4.50 ± 0.12 meq/kg- 14.83 ± 0.60 meq/kg) and saponification values (34.26 ± 0.29 mg KOH/g - 220.19 ± 0.47 mg KOH/g). P-value of <0.05 was obtained for all the parameters showing that there is no notable difference between the values of the physicochemical parameters of all the palm oil samples. Palm oil samples from Lagos, Kogi and Edo showed most of the physicochemical parameters that agreed with the Standard Organization of Nigeria (SON) limit indicating high quality palm oils. However, palm oils from Imo showed physicochemical parameters that exceeded the standard set by SON and was associated with the primitive processing techniques, poor storage practice, the usage of bad palm fruits, climatic and soil conditions. There should therefore be adequate sensitization of palm oil traders, farmers and manufacturers along with enforcement to ensure best practices are employed during processing, transportation, and storage of the palm oil products.

Keywords: palm oil, physicochemical properties, quality.



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ANTI-DIABETIC ACTIVITY OF THE SYNERGISTIC EFFECT OF METHANOL EXTRACTS OF *VERNONIA AMYGDALINA* AND *ALLIUM ASCALONICUM* IN ALLOXAN INDUCED DIABETIC RATS

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Abstract

The quest for novel anti-diabetic medication from medicinal plants is indispensable since they contain bioactive phytochemicals that offer better activity. In this study, effect of the individual and synergistic ant-diabetic potentials of *Vernonia amygdalina* and *Allium ascalonicum* were determined in alloxan induced diabetic rats. Qualitative and quantitative phytochemical screenings were carried out using standard methods. Acute toxicity (LD₅₀) of extracts was determined by Lorke's Method. Diabetes was induced using 200mg/kgbw of alloxan monohydrate while treatment was administered in doses 200 mg/kgbw and 400 mg/kgbw for single and combined extracts in these percentages :75 vs 25 %,50 vs 50 % and 100 %. *In vivo* antioxidant activity was carried out following standard procedures. *In vivo* anti-inflammatory activity was performed according to Ekpendu et al., method. Histopathological examination was carried out by adopting the method of Arsad *et al.*, while characterization of the active compounds was analyzed by FTIR and GCMS. The results of the qualitative Phyto-composition showed the presence of important phytonutrients such as alkaloids, flavonoids, saponins and phenols while quantitative Phyto-composition showed that phenols was most prominent (113mg/100g) in *Allium ascalonicum* and Alkaloids (99mg/100g) in *Vernonia amygdalina*. The LD₅₀ of the single and combined fractions were all save above 5000mg/kgbw. All the extract treated groups exhibited some hypoglycemic activities in dose dependent manner. However, the combined extracts (AA) 75% *Allium ascalonicum* vs 25 % *Vernonia amygdalina* had the highest (60.29%) percentage glucose reduction at 400mg/kgbw and was selected as the most active extract. AA had Percentage paw oedema inhibition (46.89%) and a significant increase (P <0.005) on the antioxidant enzymes activities when compared to the negative control. The histology of the hepatocellular architecture was well preserved with no abnormalities. This study suggested that combined extract AA has hypoglycemic potentials which could be further studied.

Keywords: bioactive, phytochemicals, hypoglycemic, diabetic



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Effect of Flavonoids-Rich Extract of *Calotropis procera* Leaf on *Bitis arietans* Venom

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Abstract

Snakebite envenomation is a neglected tropical disease that causes high morbidity and mortality and the bites from the *Bitis arietans* species account for one of the highest snakebite fatalities in Africa. The effect of the flavonoids-rich extract of *Calotropis procera* leaf on *Bitis arietans* venom was determined in this study. The flavonoid content was quantified using colorimetric method. *In vitro* enzyme inhibition assay was carried out for phospholipase, protease and acetylcholinesterase using standard methods. Acute toxicity (LD₅₀) of the extract was determined by Lorke's Method. LD₅₀ of *B. arietans* venom and *in vivo* venom inhibition activity were carried out using mice. Mice were divided into 5 groups, with group 1 as normal control, group 2 negative control, while groups 3-5 were treated with 100, 200 and 400 mg/Kg body weight (BW) of butanol fraction after being envenomed. The result showed that the flavonoid content was found to be highest in the butanol fraction (66.38±0.61 g/100g). *In vitro* inhibition assay showed a dose dependent pattern of the butanol fraction and significant (p<0.05) inhibition of phospholipase, protease and acetylcholinesterase enzymes. The butanol fraction was safe at doses above 5000 mg/KgBW. Oral administration of 100, 200 and 400 mg/KgBW of butanol fraction significantly inhibited (p<0.05) the haemorrhagic activity, necrotizing activity and haemolytic activity of the venom and also increased the clotting time. Dose levels of 200 and 400 mg/KgBW of the butanol fraction significantly decreased the bleeding time. The flavonoid content of *C. procera* leaf possess therapeutic potential against *B. arietans* venom.

Keywords: Flavonoids, *Bitis arietans*, Enzyme Inhibition, *Calotropis procera*, Snake venom.



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SYNTHESIS AND DEPOSITION OF ZnO/TiO₂ NANOCOMPOSITES USING SPRAY PYROLYSIS METHOD FOR SOLAR CELL APPLICATION

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Abstract

Zinc oxide (ZnO) and Titanium dioxide (TiO₂) were deposited by spray pyrolysis method, ZnO and TiO₂ nanoparticles were doped on a glass substrate to produce ZnO/TiO₂ nano composite samples at different molar ratio and different temperature (300 °C, 350 °C, 400 °C and 450 °C). The obtained samples were characterized using UV-visible spectroscopy (UV-Vis), X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and Energy Dispersive X-ray Spectroscopy (EDS). It was observed that the presence of TiO₂ enhanced the optical properties of ZnO thereby increasing the energy band gap of the nanocomposites while the XRD showed the presence of majorly amorphous and crystalline nature having short range periodicity of mixed ternary and quaternary phases of ZnO and TiO₂ samples. The SEM images shows that the thin film were composed of several irregular aggregates of ZnO and typical diamond spherical shaped particles, It was observed that with the increased energy band gap and relative high transmittance the nanocomposites can be used in solar cell and photo diode application.

Keywords: Zinc Oxides, Titanium dioxide, Nanocomposites, Spray pyrolysis



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HEPATONEPHROPROTECTIVE EFFECT OF *COCOS NUCIFERA* OIL ON DICHLORVOS EXPOSED RATS

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Abstract

High burden of insect vectored diseases particularly in the tropics has led to the development of various means of controlling insects of which includes the use of insecticides. These insecticides are very potent on target organisms (insects), as well as been toxic to non-target organisms, even man - manifesting cases of neurotoxicity, cytotoxicity, hepatotoxicity etc. A number of medicinal plants, herbs and oils have however been discovered by herbal practitioners to ameliorate such toxicities; with example, *Cocos nucifera* (coconut) oil. This study is aimed at assessing the hepatonephroprotective effects of coconut oil on dichlorvos (an organophosphate) exposed rats. Twenty adult male wistar rats weighing 171.3-220.8g were randomized into six groups. Rats in group A (the control) were neither exposed to dichlorvos nor treated with coconut oil. Rats in group B (the negative control), were exposed to 0.5LC₅₀ of dichlorvos (1hour daily), but not treated with coconut oil. Rats in groups C, D, E and F were exposed to 0.5LC₅₀ of dichlorvos (1hour daily), but treated with 250, 500, 750 and 1000mg/m³ of coconut oil respectively. The experiment lasted for 28days. Blood samples were collected by carotid puncture for analyses of some liver and renal function parameters using DIALAB diagnostic kits, while liver, kidney and lung organs were collected and fixed into appropriate sample bottles. The variables for liver (AST, ALT and ALP) and renal function parameters (urea and creatinine) were considered significant at $P \leq 0.05$. There was a marked increase in the hepatonephroprotective effect of coconut oil in the various parameters observed in a dose dependent manner.



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SYNTHESIS OF CELLULOSE NANOFIBER HYDROGEL BEADS FROM *TYPHA ANGUSTIFOLIA* FOR THE IMMOBILIZATION OF PROTEASE

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Abstract

This study investigates the potential of cellulose nanofibers (CNF) derived from *Typha angustifolia* for enzyme immobilization. This study aimed to synthesize CNF hydrogel beads from *T. angustifolia* for protease immobilization. CNF isolation involved chlorite delignification and alkaline extraction, followed by oxidation and hydrogel synthesis with polyvinyl alcohol (PVA). Characterization of the CNF hydrogel beads through scanning electron microscopy (SEM) and Fourier-transform infrared (FTIR) spectroscopy revealed their structural integrity and functional groups conducive to enzyme immobilization. The immobilization of protease on the CNF hydrogel beads resulted in a notable enhancement in specific activity for the immobilized enzymes, reaching 59.20 U/mg, compared to 24.56 U/mg for free enzymes. Additionally, the process exhibited a loading efficiency of 50.61%. Time-course activity assays demonstrated a steady increase in enzyme activity over time, reaching a peak at 8 minutes post-immobilization. Further experiments explored the effects of temperature and pH on enzyme activity. Immobilized enzymes exhibited higher activity across a range of temperatures (30°C to 70°C) and pH levels (5 to 10) compared to free enzymes, with optimal activity observed at 50°C and pH 9. Additionally, stability studies revealed that immobilized enzymes maintained higher activity levels over 5 hours compared to free enzymes, suggesting improved stability conferred by immobilization. Storage stability assessments showed that immobilized enzymes retained a higher percentage of their original activity after 7 days compared to free enzymes, indicating enhanced longevity and shelf-life. These results underscore the potential of immobilized enzymes for various biotechnological applications, warranting further exploration and optimization of immobilization techniques for industrial-scale use.

Keywords: *Typha angustifolia*, immobilization, cellulose, cellulose nanofibre, protease.