

PATHOGENICITY OF FIVE FUNGAL SPECIES ISOLATED FROM *ELDANA SACCHARINA* (WALKER) (LEPIDOPTERA: PYRALIDAE)

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ABSTRACT

*Maize is one of the most important cereal crops grown in Africa by commercial and small-scale farmers. It serves as a staple food for millions of people in Africa. Maize production is, however, constrained by many biotic factors including lepidopteran stem borers such as *Eldana saccharina*, which feed inside stem and rob the maize plant of water and nutrients. Many of the currently existing methods of controlling stem borers are either too expensive or inefficient. There is therefore, a need to find alternative control methods including the use of biological agents such as fungal pathogens. Dead *Eldana saccharina* larvae were collected from harvested maize farms around Kumasi in the Ashanti Region of Ghana. They were taken through a process to isolate and identify fungal pathogens with which pathogenicity tests were performed on healthy *E. saccharina* larvae. The median lethal time (LT_{50}) was determined for the fungal species that were pathogenic to *E. saccharina*. The isolated fungal species were *Aspergillus flavus*, *Verticillium albo-atrum*, *Trichothecium* spp., *Fusarium oxysporum* and *Alternaria brassicicola*. Out of the five, *A. flavus* had the largest corrected percentage mortality of 66.3 % at a concentration of 1×10^7 c.f.u./ml. *A. flavus*, and *V. albo-atrum*, were pathogenic to *E. saccharina*. *Trichothecium* spp. was moderately pathogenic while *F. oxysporum* and *A. brassicicola* were not pathogenic to *E. saccharina*. *A. flavus* and *V. albo-atrum* could, therefore, be incorporated into an integrated approach to control *E. saccharina*.*

SELECTION OF NEW STANDARD CROSSES FOR THE OIL PALM (*Elaeis guineensis* J.) THIRD CYCLE OF SELECTION

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ABSTRACT

*Oil palm breeding at the Oil Palm Research Institute, Kusi in Ghana, has gone through the first and second cycles of selection. In the second cycle of selection, the highest yielders in the first cycle of selection were the standard crosses. Eighty-eight (88) *Dura x Pisifera*, *Dura x Tenera* and *Tenera x Dura* crosses were evaluated for yield in ten progeny trials established from 1987 to 1994 as part of the second cycle of selection. The design for these trials was a randomized complete block. The results indicated improved fresh fruit bunch yield over the standard crosses used as controls. The newly selected standard crosses were K1: 3749D x K3.782P, K4. 373D x 851.805P and K4. 621D x 851.805P which had FFB yields of 14.74, 13.24 and 12.82 tonnes per hectare per year respectively. These yields were higher than the previous standard crosses of K1.3747D x K3.880P and K1.3747D x K3. 734T which had FFB yields of 12.29 and 11.69 tonnes per hectare per year respectively. The three crosses from the second cycle of selection were selected due to their superior performance over the second cycle standard crosses and will serve as the new standard crosses for the third cycle of selection.*

POTASSIUM IONS IMPROVE THE PROGESTERONE-INDUCED $[Ca^{2+}]_i$ INCREASE AND ACROSOME REACTION AS WELL AS THE POTASSIUM-INDUCED $[Ca^{2+}]_i$ INCREASE IN HUMAN SPERMATOZOA

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ABSTRACT

Ejaculated sperm undergo a series of physiological changes in the female reproductive tract to become capable of fertilization. These changes, called capacitation can be induced *in vitro* in appropriate media and culminate in hyperactivated motility and the ability of the sperm to acrosome-react. These downstream effects of capacitation are mediated by increased intracellular Ca^{2+} concentration ($[Ca^{2+}]_i$). Exposure of sperm to progesterone (P_4) and potassium (K^+) induce an increase in $[Ca^{2+}]_i$. The effects of incubating sperm in media containing different potassium concentrations on the P_4 -induced $[Ca^{2+}]_i$ increase and AR as well as the effect of K^+ on $[Ca^{2+}]_i$ increase were investigated. Swum-up spermatozoa were capacitated for about 6 h in culture media containing either 5.4 (control), 25 or 116.4 mM K^+ before being stimulated with P_4 . P_4 evoked a biphasic $[Ca^{2+}]_i$ response in spermatozoa incubated in each of the media. The amplitude of the transient P_4 -induced increase in $[Ca^{2+}]_i$ and the percentage of P_4 -induced AR were significantly lower in sperm incubated in media with very low or very high K^+ concentration. Absence of K^+ in the incubating medium significantly inhibited the amplitude of both the P_4 - and K^+ -induced $[Ca^{2+}]_i$ increases. Application of K^+ after P_4 application evoked a second biphasic $[Ca^{2+}]_i$ response. The results suggest that i) the presence of K^+ in the incubating medium is important in the K^+ -induced $[Ca^{2+}]_i$ increase as well as the P_4 -induced $[Ca^{2+}]_i$ increase and AR, ii) human sperm capacitates better in an incubating medium with a K^+ concentration around that of oviductal fluid and iii) P_4 - and K^+ utilize different channels for inducing Ca^{2+} influx.

PHYLOGENETIC ANALYSIS OF THE BEE TRIBE ANTHIDIINI

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ABSTRACT

The phylogenetic relationships among members of long tongue bee tribe Anthidiini (Megachilidae: Megachilinae) were investigated at the Department of Entomology and Wildlife, University of Cape Coast (Ghana) and the Agricultural Research Council, Pretoria (South Africa) from July, 2006 to May, 2007. Ten museums located in three continents loaned the 990 specimens used for the studies. Thirty-three ingroup taxa out of the 37 known genera of the world's Anthidiini and two outgroup genera, were included in a cladistic analysis of the tribe based on 51 adult external morphological characters. The cladograms yielded three major clades which have been erected as subtribes for the world's Anthidiini, namely Afranthidina, Anthidina and Euaspina. Monophyly of the Anthidiini was confirmed. Based on the result of the cladistic analysis and biogeographic data, it is suggested that the origin and center of radiation for the Anthidiini probably occurred in the southern pantropic region (Southern Africa to South East Asia) of Gondwana. A second and independent migration to the Neotropical region by the probable ancestors of the current Neotropical genera is also conceivable.

TAXONOMIC SIGNIFICANCE OF SOME VERNACULAR NAMES OF OKRA ACCESSIONS (*ABELMOSCHUS* SPP.) IN GHANA

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ABSTRACT

The aim of this study was to examine the folk criteria used by farmers to name their local okra varieties and also to assess the taxonomic significance of vernacular names in the identification and classification of these okra varieties in Ghana. Forty two okra accessions and their vernacular names were obtained from PGRRI, Bunso for the study. The various vernacular names of okra accessions were taxonomically analysed by determining their linguistic meanings, their folk criteria and their folk classification. The folk classification of the different okra accessions were then compared with numerical classification of the same set of accessions of another study based on their quantitative and qualitative morphological characteristics. Based on the taxonomic analyses, the 42 vernacular names of okra accessions in Ghana consisted of languages like Twi, Ewe, Dagbani and Krobo and were also based on folk criteria such as morphology, fruit characters, names of persons or locality, maturity periods and culinary properties. Folk classification of the 42 okra accessions produced 8 different taxonomic groupings which contrasted with numerical classification of the same set of okra accessions. Thus, vernacular names of okra accessions in Ghana could not be used as the sole criterion in the identification and estimation of okra diversity because of the low degree of consistency between the two different methods of classification.

SEASONAL VARIATION IN THE OCCURRENCE OF PREGNANCY-INDUCED HYPERTENSION - A GHANAIAAN STUDY

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ABSTRACT

Pregnancy-Induced Hypertension (PIH) is one of the leading causes of maternal, neonatal and infant mortality. Several studies have suggested that the occurrence of PIH may be dependent on environmental factors. Although, several countries have documented the prevalence of PIH, little is known about the occurrence and seasonal variations in the incidence of PIH in Ghana. This study was therefore conducted to assess whether seasonal variation has any effect on the prevalence of PIH. Between, 2006 and 2007, a retrospective observational hospital-based study was conducted at the Obstetric and Gynaecology Department of the Komfo Anokye Teaching Hospital (KATH) using pregnancies of gestational age more than 20 weeks. Maternal age, parity, birth weight and maternal death, occurrence of gestational hypertension, preeclampsia, PIH and seasons were variables evaluated and analyzed using SAS System for windows, version 6.12. Of the total of 8,091 antenatal visits to the Hospital, 12.42% presented with PIH, 6.55% with preeclampsia whilst gestational hypertension was identified in 5.87% of pregnant women. The younger mothers as well as the older aged mothers were more prone to presenting with these conditions and delivery of low birth weight babies was more prevalent among these cohorts of women. The prevalence for all the above-mentioned conditions generally declined during the dry season. An association between the rainy season and increased incidence of hypertensive disorders of pregnancy was evident. The hypertensive condition was more prevalent among the extremes of age and associated with the delivery of babies with low birth weight.

SOYBEAN PEPTIDE AS ADDITIVE ON YELLOW FEATHER BROILER CHICKS: NUTRITIONAL AND BIOCHEMICAL PROFILES

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ABSTRACT

The peptide under investigation was biotechnologically manufactured from non-GM soybean and sold on the Chinese market by China CF Duqing (Heze) Biotech Co. Ltd, Shandong Province, China. For the purpose of this study, the peptide was designated marketed soybean peptide (MSBP). In order to show its efficacy as growth promotant, it was used as additive in experimental diets at the inclusion levels of 0.1%, 0.2%, 0.3%, 0.4% and 0.5%. The control diet was mainly basal broiler starter feed. The duration of the study was 3 weeks. The total number of day-old-chicks used was 1,620 and the experimental design was such that it had 6 treatments of 6 replicates with 45 chicks per replicate. Six chicks were randomly selected from each replicate at the end of the study and blood samples as well as some organs were taken for biochemical assays. There were significant improvement in average daily weight gain (ADWG) and feed conversion efficiency (FCE) in chicks fed diets containing 0.1% and 0.4% MSBP compared to those fed the other diets, including the control [$P<0.05$]. The use of MSBP at the stated levels did not influence the total lipid levels in the heart and liver, serum triglyceride and HDL in all the chicks fed those diets relative to the control ($P>0.05$). The study further revealed that increasing the concentration of MSBP in the diets did not cause a corresponding increase or decrease in the serum levels of AST, ACP, total protein, albumin and globulin. Also, MSBP, at all the levels of inclusion studied, resulted in significant serum cholesterol reduction compared to the control treatment ($P<0.05$) i.e. the cholesterol lowering ability of MSBP was established.

INFORMATION AND COMMUNICATION TECHNOLOGY AVAILABILITY, ACCESS AND USE BY AGRICULTURAL EXTENSION AGENTS AND FARMERS IN DANGME EAST DISTRICT, GHANA

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ABSTRACT

Ghana's agricultural extension has not experienced substantial change in its mode of information dissemination. This study seeks to examine the extent of access and use of Information and Communication Technologies (ICTs) by Agricultural Extension Agents (AEAs) and farmers and how they harness their potentials in their agricultural activities. Dangme East District in Southeast Ghana was purposively selected for this study. A multi-stage cluster sampling procedure was used to randomly select 120 small scale farmers and 21 AEAs from three villages in the three agricultural zones in the district. Data was collected using structured questionnaires and focus group discussions. Results showed that apart from computer and internet which were not available, all AEAs and most farmers have personal access to mobile phone, television and radio which they use to source and communicate agricultural information. However, for decisions with regard to production, input acquisition up to marketing of farm produce, farmers to a large extent depend more on non-ICT sources. On the other hand, for meteorological information, farmers depend more on radio, television and mobile phone. There was significant relationship $p=(0.00$ and $0.042)$ between farmers extent of access to mobile phone and radio and its use in agricultural activities. Also, there was a significant difference $p=(0.03)$ between extents of access to T.V and how often farmers used it in their agricultural activities. There is a great scope and potential for agricultural extension service to explore the use of television, radio and mobile phones to enhance farmers' access to timely agricultural information.

SEROPREVALENCE AND RISK FACTORS FOR HUMAN IMMUNODEFICIENCY VIRUS, HEPATITIS B AND C VIRUSES INFECTIONS AMONG BLOOD DONORS AT THE BOLGATANGA REGIONAL HOSPITAL IN BOLGATANGA, GHANA

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ABSTRACT

This study sought to determine the seroprevalence of human immunodeficiency virus (HIV), hepatitis C virus (HCV), and hepatitis B surface antigen (HBsAg) among blood donors at Bolgatanga Regional Hospital, Ghana by blood group type, sex and age and also determining the association, if any, in the occurrence of the pathogens. The study population consisted of 4146 consecutive donors, 3920(94.5%) males and 226(5.5%) females, who donated blood between January 2004 through December 2007. Their age ranged from 17 to 58 years, and most (49.1%) were between 17-27 years. The seroprevalence of HIV, HBsAg and HCV among the subjects was found to be 4.05%, 12.64% and 3.57%, respectively. A higher prevalence of HBsAg was found among males 12.81% (502/3920) than in females 9.73% (22/226). There were no significant sex differences in the occurrence of HIV and HCV ($p > 0.05$ in each case). The age-specific prevalence of HBsAg decreased from 13.67% in donors aged 17-27 years through 8.68% in the 38-47 age group to 0.00% in the 58-67 year age group. Rh-negative blood group donors and Rh-positive group donors had similar prevalence rates of these viral infections. Whereas the highest seroprevalence of HBsAg was seen in blood group B (16.28%) and the lowest in blood group AB (0.00%), for HCV and HIV, the highest seroprevalence (5.88%) was seen in blood group A and the lowest in blood group AB (0.00%) among the Rh-negative group. The high seroprevalence of blood-borne infections in blood donated at Bolgatanga Regional Hospital calls for rigorous screening of blood donors, especially the younger population, for HBV, HCV and HIV and the establishment of strict guidelines for blood transfusions. Hepatitis positivity in the study population was statistically not associated with ABO blood groups.

A PRELIMINARY STUDY OF ASSOCIATION OF ERYTHROCYTE SEDIMENTATION RATE WITH MALARIA-SPECIFIC IMMUNOGLOBULIN G AND MALARIA-INDUCED ANAEMIA

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ABSTRACT

Evidence-based practice in medicine requires clinical signs and symptoms of malaria to be confirmed by microscopic detection of the parasite in blood sample of patients. In some cases, however, such signs and symptoms persist without microscopic detection of the parasite in blood smears, making it difficult for treatment decision to be made by medics. To help solve the above problem and to ensure that antimalarial drugs are given to patients who actually suffer from malaria infection, we designed this cross-sectional study to measure ESR, mIgG, Hb and parasitaemia levels in 78 clinically diagnosed malaria patients attending the Elmina Urban Health Centre, in the Komenda-Edina-Eguafo-Abirem Municipal Assembly in the Central Region of Ghana, with the view to finding alternative biomarkers for malaria infection. Apart from the Hb levels which differed significantly ($P=0.001$) between the sexes, the levels of all the other measured indicators of malaria infection

were comparable between the various groups. ESR correlated positively with mIgG ($r = 0.242$, $P = 0.033$) but negatively with Hb ($r = -0.348$, $P = 0.002$) irrespective of age, sex or percentage parasitaemia. Our results appear to suggest that an ESR level of twice the upper reference value of an individual may be diagnostic of malaria infection in the presence of the appropriate recognized signs and symptoms of malaria without microscopically detectable parasitaemia in the blood sample of patients. We propose that ESR and mIgG be considered as complementary markers of malaria infection in cases of unsuccessful microscopic detection of the malaria parasite in blood smears.

NUMERICAL TAXONOMY AND MORPHOLOGICAL VARIATION OF CULTIVATED OKRA SPECIES (*ABELMOSCHUS ESCULENTUS* AND *A. CAILLEI*) IN GHANA

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ABSTRACT

A numerical taxonomic study was conducted to investigate the patterns of morphological and phenological variations in 45 okra accessions from different agroecological zones of Ghana during the rainy season of 2005. The results of the study showed that there were two main phenetic groupings of okra accessions in Ghana based on both 14 quantitative and 17 qualitative morphological and phenological characteristics. These two phenetic groupings could be tentatively linked to the taxonomic descriptions of *A. esculentus* and *A. caillei* accessions. Morphological and phenological characters like stem diameter, leaf length, petiole length, fruit positions and days to flower opening were identified as diagnostic characters that could be used to separate okra accessions in Ghana into *A. esculentus* and *A. caillei*. The study also indicated that there was a weak agroecological adaptation among the 45 okra accessions and therefore agroecological origins of the various accessions could not be used as one of the criteria in the development okra core collection in Ghana.

THE EFFECTS OF PPAR DELTA AND ALPHA AGONIST ON FATTY ACID AND GLUCOSE METABOLISM *IN VIVO* AND IN MOUSE ISOLATED SOLEUS MUSCLE

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ABSTRACT

The peroxisome proliferator-activated receptors of the nuclear receptor superfamily are heterodimers with the 9-cis retinoic acid receptor and bind to specific peroxisome proliferators response elements to regulate the transcription of their target genes resulting in the regulation of lipid, metabolism, glucose homeostasis and inflammation. Activation of these receptors by their agonists has since been shown to play critical and unique roles in lipid homeostasis. This work was designed to study the effects of PPAR- δ agonists and PPAR- α agonist on lipid and glucose homeostasis in models of diabetes and obesity in C57B1/6 mice. The effect of PPAR- δ agonist, GW610742, and PPAR- α agonist GW649003 on lipid and glucose metabolism were studied in C57B1/6 lean and obese mice. GW610742 was administered, p.o at 3mg/kg body weight and 10mg/kg body weight at 09.00h and 17.00h in two separate groups of lean mice in an acute study. The dosing was repeated over seven days in another two groups of mice in the chronic study. C57B1/6 obese and lean mice were also dosed with GW800644 (10mg/kg) and GW649003 (1mg/kg) p.o at 09.00h and 17.00h for 14 days. At the end of study, glucose, lactate, and NEFA were measured. Animals were killed; whole organs were removed and weighed. The soleus muscles were isolated and used to determine 2-deoxyglucose uptake and palmitate oxidation. GW610742 did not show any significant metabolic changes in lean mice in both the acute and chronic studies. However, chronic treatment

with GW800644 and GW649003 in ob/ob mice, resulted in an increase uptake of 2-deoxyglucose and palmitate oxidation in mouse isolated soleus muscle and decreased plasma glucose and insulin levels. However, GW649003 also induced hepatomegaly in lean mice but not in the obese. The fact that both PPAR- δ agonist GW800644 and PPAR- α agonist GW649003 showed a positive lipid, glucose and insulin homeostasis only in mice with these metabolic defects shows they have the potentials to be developed into drugs for management of diabetes and obesity.

RAINFALL VARIABILITY IN GHANA DURING 1961- 2005

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ABSTRACT

This study uses daily rainfall data for 40-45 years to investigate the extent and nature of variability in the onset, cessation, annual rainfall and length of the rainy season (LRS) over four stations in Ghana (Tamale, Kumasi, Axim and Accra). The study shows that generally, the early onset and late cessation dates that occurred in the 1960s and early 70s and which resulted in long rainy seasons almost everywhere in Ghana have now changed significantly, the onset occurring rather late with early cessation since the 1980s. However, cessation for Accra was late from the 90s resulting in slightly longer rainy season. Pentade series of annual rainfall and rainy days also show a significant downward trend at all the stations but particularly more so at Axim. All these have serious consequences for agricultural practices and water resources management, particularly for hydropower generation in the country. Classification of the annual rainfall into wet and dry years and consideration of moisture availability shows significant differences between years of abundant and deficient rainfall. It was found that wet (dry) years have early (late) onset and late (early) cessation resulting in longer (shorter) rainy season. Also, rainfall amount and length of the rainy season during dry years are reduced by about 50% and more than 30 days, respectively at all stations. In general, main rainfall begins about 2-months after the moisture influx has attained a maximum value over all stations. The study also shows that dry spells of 10 or more days between rain events occur more frequently in the southern parts of Ghana than the north.