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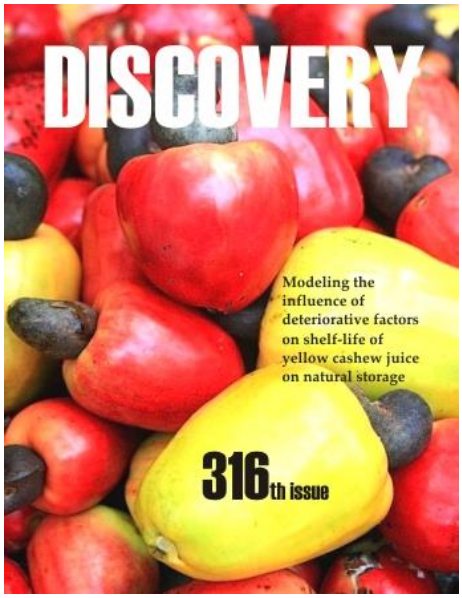
DISCOVERY

About the Cover



There is an inevitable decline in quality value of ascorbic acid in storage and distribution of cashew apple juice. The quality value and optimum shelf life of yellow sample of cashew apple juice were determined and the quality value model based on the deteriorative factors was developed. The coefficient of correlation (R^2) of the dependent variable (ascorbic acid or vitamin C) and independent variables (temperature, total soluble solid (TSS), pH and duration of storage) in the regression models of the sample was 0.988. Data were drawn from 3^4 full factorial experiments performed in three replicates with the order of the replicates randomized. A multivariate regression analysis was used for combining the variables. The model developed revealed that temperature, pH and duration of storage with some other interactions were the major factors that influence the shelf -life and also determine the character and qualities of cashew fruit juice. The developed models further revealed that 38.6^{O}C storage temperature, 11.68^{O}Brix value, pH of 4.61, and storage duration of 16 days of yellow sample retained ascorbic acid levels at 218.11 mg/100 ml on maximum shelf life. Equation 34 expresses the regression model for determining the shelf life of yellow sample of cashew fruit juice (Ref: Chikwado UK, Ifeanyi OW. Modeling the influence of deteriorative factors on shelf-life of yellow cashew juice on natural storage. *Discovery*, 2022, 58(316), 270-284).

Implementation of Information Communication Technologies and Machine Learning in Tanzania for Precise Agriculture: A Review

Ghaniya Rashid, Paulraj Prabhakaran

Precision agriculture is needed possibly in the future to increase the quality of products from agriculture and services. Information Communication Technology (ICTs)-based and Machine Learning (ML) applications are to be used to cut costs and improve trade. The goal of this study is to design the most common uses of ICTs and how they are used in agriculture, weather forecasting, prediction of minimum and maximum rainfall, soil fertility, minimum and maximum temperature, unnecessary fertilizer, pesticide use, detection of soil nutrients, crop management, livestock monitoring, and water management are all examples. The study focuses on presenting a comprehensive assessment of studies on machine learning applications in an agricultural production system and ICTs studies from various scholars for ten years (2011-2021). By employing ICTs and ML in topics mentioned above the challenges related to traditional data management techniques would be solved.

Discovery, 2022, 58(316), 244-251

Use of multistage phytoremediation technique in wastewater treatment

Lucy Wanjohi, Lizzy Mwamburi, Shem Mwasi, Doreen Meso, Job Isaboke

Efficient treatment of wastewater before discharge into aquatic ecosystems is a requirement to prevent the detrimental effect of polluting the environment and safeguard public health. Adoption of green technology in wastewater treatment is paramount. This study was carried out to investigate the efficiency of the multistage technique in the phytoremediation of wastewater. The experimental setup was a four-stage treatment system. It comprised of four columns with different arrangements of macrophytes that included *Ceratophyllum demersum*, *Typha latifolia*, *Nymphaea* spp., and *Azolla pinnata*. Wastewater was sampled and put in four twenty-liter pre-sterilized plastic containers and allowed to flow to plastic troughs, each containing the experimental plants from stage 1 to stage 4 with a retention time of 5 days. Water indicator parameters, nutrients, and heavy metals in the wastewater were analyzed at the beginning of the treatment process and from each trough in each column at the end of the retention time of 5 days for a period of 20 days to determine the changes in the levels of the parameters investigated. Means of mentioned parameters were calculated and analyzed using ANOVA and significant means separated using Tukey's test at 5% level. Removal efficiency of the investigated parameters was calculated and the range was as follows; total dissolved solids 79.13-82.27%, pH 14.12-16.67%, conductivity 66.92-71.48%, turbidity 67.97-80.54%, faecal coliforms 100%, faecal streptococcus 100%, phosphates 93.72-100%, nitrates 89.79-100%, cadmium 83.40-100%, copper 83.39-88.60%, nickel 100%, cobalt 100%, lead 100%, manganese 100%, zinc 100% and iron 88.60-95.77%. The multistage technique was found to be efficient in wastewater treatment. This technique is a green technology that is efficient and economical hence recommended for remediation of wastewater.

Discovery, 2022, 58(316), 252-263

Prediction of growth pattern of marshal chicken using three regression model

Lamidi Oladejo, Ojedapo, Oluwadamilare David, Ifanegan, Blessing Abiola, Oyetoro, Durotoluwa Ojesanmi

This study aims to investigate the prediction of growth pattern of Marshall Chicken using regression model. A total of 300 day-old chick of birds comprised of males and females were procured from a reputable farm in Ibadan, Oyo state. On the day of arrival, the chicks were supplied with water and anti-stress plus antibiotics for a period of 5 days during brooding. The birds were raised under deep litter management system. The coefficient of determination (R) values in Marshall Strain, with keel length recording the highest value (94, 95 and 98) respectively in all the functions. The growth pattern using mathematical model or function in this research revealed that the leading key indicators (Standard error, determination coefficient and correlation of determination), suggest that Simple Linear Regression is more appropriate to describe growth pattern of Marshal strain compare to quadratic and cubic functions. All the linear body parameters have their R values above 50%, that is, they could be used to predict the body weights of the broiler strain, although the accuracy of prediction increase with an increase in the R value. In summary, amongst all the linear body parameters evaluated, the keel length had the highest R value in all the functions.

Discovery, 2022, 58(316), 264-269

Modeling the influence of deteriorative factors on shelf-life of yellow cashew juice on natural storage

Ugwu Kenneth Chikwado, Okonkwo Wilfred Ifeanyi

There is an inevitable decline in quality value of ascorbic acid in storage and distribution of cashew apple juice. The quality value and optimum shelf life of yellow sample of cashew apple juice were determined and the quality value model based on the deteriorative factors was developed. The coefficient of correlation (R^2) of the dependent variable (ascorbic acid or vitamin C) and independent variables (temperature, total soluble solid (TSS), pH and duration of storage) in the regression models of the sample was 0.988. Data were drawn from 3^4 full factorial experiments performed in three replicates with the order of the replicates randomized. A multivariate regression analysis was used for combining the variables. The model developed revealed that temperature, pH and duration of storage with some other interactions were the major factors that influence the shelf -life and also determine the character and qualities of cashew fruit juice. The developed models further revealed that 38.6^{O}C storage temperature,

11.68^{O}Brix value, pH of 4.61, and storage duration of 16 days of yellow sample retained ascorbic acid levels at 218.11 mg/100 ml on maximum shelf life. Equation 34 expresses the regression model for determining the shelf life of yellow sample of cashew fruit juice.

Discovery, 2022, 58(316), 270-284

Climate Change, Ecology and Management of Tropical Floodplain Lakes: A review

Nwinyimagu, Amaechi Joshua

The dreadful condition of the environment and the frequent occurrence of natural disasters have been a central concern in the policy debate over climate change. More challenging is the capacity of man and the entire system to avoid, alleviate and recuperate from the climatic hazards. These issues make it very difficult to predict and monitor environmental changes. The trend of climate change resulting from global warming has also affected the ecology of the tropical floodplain lakes invariably in recent years. Decrease in rainfall, atmospheric humidity and rise in temperature have affected water levels in tropical floodplain lakes. Consequent upon this, some tropical floodplain lakes have faced severe evaporation, turning more salty and eventually leading to loss of biota. Considerably, change in the climate tends to alter the timing and frequency of rainfall, which will have serious consequence on the ecology of floodplain lakes.

Discovery, 2022, 58(316), 285-292

Effect of cinnamon powder on growth performance characteristics of cockerel chickens

Adedeji OS, Oyetoro BA, Adewole TA, Ifanegan OD

The goal of the study was to look at the growth characteristics of cockerel chicks given different amounts of cinnamon powder. The study used a total of 150 day old Isa Brown strain birds, which were randomly assigned to five treatments of 30 birds each, with three replicates of 10 birds per replica. T1, T2, T3, T4, and T5. Dietary treatments included 0g, 2.5g, 3.0g, 3.5g, and 4.0g cinnamon powder supplementation in 4 litres of water. The experiment lasted for 16 weeks and data were collected on body weight, feed intake, weight gain, feed conversion ratio, and mortality rate. The result revealed that cinnamon supplementation affected the body weight, feed consumption, weight increase, feed conversion ratio, and mortality rate significantly ($p<0.05$). In conclusion, it can be deduced that chickens on T_5 (4.0g of cinnamon in water) had an improved body weight (935.9g), weight gain (83.35g), feed intake (331.10g), feed conversion ratio (10.99g) and zero mortality compared with other dietary treatments.

Discovery, 2022, 58(316), 293-298

Phytotoxicity assessment of the effects of unused and spent engine oil on the germination and seedling growth of *Zea Mays* L

Akpan EN, Edem CA

The effects of unused and used engine oil on the germination and seedling growth of *Zea mays* L. were studied for phytotoxicity. Thirty poly bags containing 3kg of loamy soil were filled, with 24 bags containing varied amounts of spent and unused engine oil and 6 bags serving as controls. There were four distinct concentrations of used and unused motor oil, ranging from 50 to 200 mg/l, with three replicates for each treatment. The findings revealed a negative association between soil oil levels and the growth indices assessed (germination, plant height, number of leaves, leaf length, and leaf breadth). With increasing concentrations of the contaminant, the reductions and morphological effects in the growth properties of *Zea mays* L. with spent and unused engine oil increased. Spent engine oil was found to have more detrimental effects than the unused oil. This study therefore showed that the presence of the engine oil in the soil has great effect on the growth of *Zea mays* L.

Discovery, 2022, 58(316), 299-309

Climate Parameters and Particulate Matter (PM2.5): Implication for Air Quality Index of Port Harcourt, Minna and Maiduguri of Nigeria

Dangana K, Nwaerema P, Fred-Nwagwu WF

This study, climate parameters and Particulate Matter (PM2.5) and their implications to Air Quality Index (AQI) of Port Harcourt, Minna and Maiduguri of Nigeria has revealed the pattern of climatic variables and the pollution characteristics of the three cities in Nigeria. Secondary source of data was used in this research. The data were sourced from IQ Air Earth (https://www.iqair.com/earth?nav) air quality monitoring database. Air quality data were gathered through multi-sources, validation and visualization of real-time data from governments, sensors operated by individuals and organizations. Data were acquired from ground-based air quality monitoring stations with high data availability and unprecedented accuracy of temperature, humidity, pressure, wind flow and $PM_{2.5}$ measurements. The result showed that the mean AQI index of Port Harcourt (87.1) had the highest particulate matter pollution, followed by Maiduguri (64) and the least was Minna (43) in the particulate matter air contamination. Port Harcourt had wind pressure of 1012mb and Minna (1012mb) as characterized in their Humid and Sub-Humid zones. Maiduguri had the lowest pressure value of 1009mb due to the low moisture in the air. Port Harcourt with $PM_{2.5}$ recorded 29μg/m^2, Minna had 11.4μg/m^2 and Maiduguri recorded 18.5μg/m^2 indicating that Port Harcourt had the highest particulate matter contamination. It was recommended that massive tree planting should be implemented and $PM_{2.5}$ emission sources should be nipped in the bud without further delay.

Discovery, 2022, 58(316), 310-317

Evaluating the Performance of 50mm Accumulated Rainfall Threshold for the Determination of the Start of Wet Season over Selected Stations, Ethiopia

Tarekegn Abera

Reliable information on the start of the wet season is perceived by agricultural community as an essential part of agricultural monitoring tool. Timely information on the onset date can prominently reduce the risk of planting and sowing too late or too early. For this study in-situ rainfall data were obtained from the National Meteorological Agency of Ethiopia and daily cumulative precipitation for 17 meteorological stations were used to evaluate the 50mm cumulative rainfall threshold efficiency in determining the start of the wet season. In the evaluation, the definition suggested by SIVACUMAR was presented as a benchmark criteria to evaluate the ACMAD threshold. During the evaluation some viable statistical tests were used. The Standard Deviation (SD), the Standard Error (SE), the time-mean difference (Anomaly), coefficient of variation (CV), are applied to evaluate the performance of the ACMAD criteria over the selected stations in Ethiopia. The result indicates that the ACMAD criteria tend to exhibit an earlier onset over 15 stations out of 17 compared to the SIVACUMAR method and relatively the ACMAD criteria gave less variability in terms of the range of the onset date, the temporal variability and the coefficient of variation. Regarding the false onset test, the results shows that almost all selected stations experienced maximum dry spell length in the order of 10 to 27 days within 30 days after the 50mm cumulative rainfall requirement was satisfied. The large false onset years are more pronounced over the southwest parts of the country and which accounts about 17% in average. The second largest false onset years was found to the central parts of the country and which accounts 12 % in average. Stations belong to the south exhibited the small false onset years. Therefore, to ensure the reliability of the threshold and to reduce the risk related to false onset, the expert should look into climate drivers which could be a cause for the development of consecutive long dry spells after the attainment of the cumulative threshold.

Discovery, 2022, 58(316), 318-339

TECHNOLOGY

Techniques for Mitigating IoT Privacy and Security Issues in Healthcare: A Review

Akaninyene U Ntuen, John E Efiong, Itoro S Okoroudoh, Ogbunude F Okechukwu

In the last few years, Internet of Things (IoT) devices are widely utilized in many industries such as healthcare. These IoT devices are connected to the Internet and interact with one another to collect data for systems to analyze and make appropriate decisions. As a result, cyberattacks target IoT systems to evade security and explore the system without being discovered. The goal is to steal important information from the organisation or to cause service disruptions. This invasion of privacy and security has been the most important impediment to the widespread adoption of the IoT in the healthcare industry. Therefore, this paper examines the privacy and security challenges in healthcare IoT and suggests measures to mitigate them.

Discovery, 2022, 58(316), 340-348

SOCIAL SCIENCE

Financial technology and the banking sector performance in Nigeria (2005-2020)

ADIGA, Dauda Leviticus, ADIGWE, Patrick Kanayo, OKONKWO, Victor Ike, OGBONNA, Stanley Kelechukwu

This study examined financial technology and banking sector performance in Nigeria. The specific objectives are to examine the effect of financial technology on return on assets (ROA), return on equity (ROE), interest income (II) and non-interest income (NII) of Deposit Money Banks (DMBs) in Nigeria. The study was anchored on Technology Acceptance Model (TAM) and Central Bank of Nigeria (CBN) statistical bulletin and Nigeria Deposit Insurance Corporation (NDIC) report of various years form the data source which were subjected to Auto Regressive Distributed Lag (ARDL) technique to test the interaction between independent variables namely payment system, automated clearing services and remittance services with the dependent components in return on asset, return on equity, interest income and non-interest income at 5% level of significance. Financial technology significantly explained the variation in ROA, ROE and non-interest income DMBs in Nigeria except the variation in interest income. The study concludes that financial technology significantly explained the variation in banking sector performance components in ROA, ROE, and non-interest income. The effect of financial technology on performance of the banking sector is inconclusive thus financial technology could not be said to improve and exert the required impact on the banking sector performance within the period studied. Hence, the study recommends among others that the deposit money banks should do more in getting their customers to use financial technology products by simplifying the services, ensuring the security of the services, ensuring the speed and efficiency which will aid the improvement in the activities carried out via payment system, foreign remittances and value of automated clearing thus enhancing banking sector performance.

Discovery, 2022, 58(316), 349-360

Micro-finance banks, nexus to Nigerian economic growth

Ponjul Bulus Gonji, Kamsen Mordecai Dapim, Adekunle D Shodeinde

Purpose- It is a known fact that microfinance banks contribute greatly to the growth and development of various nations of the world, they do this via the various financial assistance they offer to low-income earners. The reason behind this paper titled "Microfinance Banks, nexus to Nigerian economy growth" is to examine the contributions of microfinance banks to the progress of Nigeria economy. This will help to draw the attention of stalk holders and regulators of the Nigerian economy to pay close attention to microfinance banks in policy formulation. *Design/Methodology/Approach-* The independent variables adopted in this study are; capital growth, interest rate, employment level, business growth and loans. These variables were empirically reviewed so as to find out the contribution of each of them to the growth and development of various economies. The independent variable is Gross Domestics Product (GDP). Data of 2 listed microfinance banks were obtained from annual reports of the microfinance banks as well as the review of the Central Bank of Nigeria from 2005-2019. STATA 13.0 was used to analyzed the data. *Finding-* The research work revealed that capital growth, microfinance interest rate, employment level and microfinance loans contribute significantly to the progress of the Nigerian economy. It also revealed that business growth does not contribute significantly to the expansion of Nigerian economy. *Originality/Value-* This study is different from other studies in various ways: It used secondary data to test the relevance of microfinance banks to the expansion of Nigeria economy. Previous studies on microfinance banks in Nigeria mostly obtained data through administering questionnaires. This study used listed microfinance banks which is a departure from previous studies that mostly used microfinance banks that are not quoted on the Nigerian Stock Exchange. Previous studies on microfinance banks in Nigeria concentrated on the microfinance banks and SMEs while this study concentrate on the contributions of the microfinance institutions to the expansion of the Nigerian economy. This is significant because microfinance banks were established to cater for the need of low-income earners which is believed to eventually add to the expansion of the economy. The research work revealed that microfinance banks is a catalyst to economy growth. Social capital theory is the theory used to underpin the study.

Discovery, 2022, 58(316), 361-369

Inventory management practices applied by stores officers in public tertiary educational institutions in south-east Nigeria

Ile Chika Madu, Mbanugo Cyriacus Izuchukwu

This study determined the inventory management practices applied by Stores Officers in public tertiary educational institutions in South-East Nigeria. Two research questions guided the study and two null hypotheses were tested. The study adopted a descriptive survey research design using a population of 747 Stores Officers in all the public tertiary educational institutions. Taro Yamani formula was used to select a sample size of 261 Stores Officers. A structured questionnaire developed by the researcher was used for data collection. Cronbach Alpha method was used to establish the reliability which yielded coefficient values of 0.85 and 0.87 for the two clusters. Out of the 261 copies of the questionnaire distributed, 208 (representing 79.69 %) were duly completed, retrieved and used for data analysis. Mean, standard deviation and ANOVA were used to analyze the data. The results showed that barcode inventory management practices were moderately applied by Stores Officers in public tertiary educational institutions in South-East Nigeria, while activity based costing inventory management practices were lowly applied. The results showed that type of institution do not significantly influenced the mean ratings of the respondents on the extent they applied barcode and activity based costing inventory management practices in universities, polytechnics and colleges of education. Therefore, it was recommended among others that tertiary educational institutions should sponsor their stores personnel to training in the area of inventory control management that will empower them to adequately apply different inventory management practices for smooth running of the institutions.

Discovery, 2022, 58(316), 370-377