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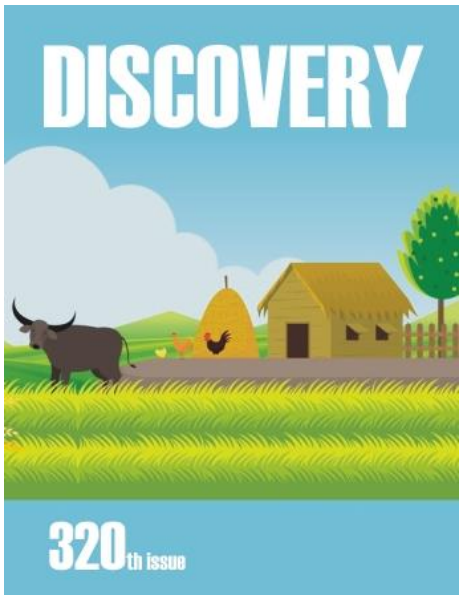
DISCOVERY

About the Cover



Characterization of drought indices in two tropical climates located in the derived Savanna and southern Guinean Savannah region of Nigeria (Lokoja, Kogi State and Minna, Niger State) using Standardized Precipitation and Evapotranspiration Index (SPEI) for a period of 33 years, (1975- 2007), and the impact of drought on their agricultural activities was investigated. Climatic data such as temperature, rainfall, and potential evapotranspiration obtained from the Climatic Research Unit (CRU) were analyzed with Microsoft excel. The Standardized Potential Evapotranspiration Index (SPEI) was analyzed with R programming language. The non-parametric Mann-kendall test was used to observe the trends of the climatic variables on an annual scale using SPSS. The Mann-Kendall test revealed that the correlation of the trend parameter was not significant for Lokoja but significant for Minna. The SPEI showed that near-normal drought condition was ubiquitous in the study areas. This paper concluded that drought events have hazardous consequences on agricultural activities in Lokoja and Minna. (Ref: Adaji JO, Ogolo EO. Characterization of drought and its impact on agriculture in two tropical stations in Nigeria. *Discovery*, 2022, 58(320), 907-913).

Fault Tree Analysis for Mitigation of Equipment Failure during Covid-19 in Nigeria: A Case Study

IGBERE Ndukam Billy, Ukpaka CP, Nkoi B

Accidental events in manufacturing industries can be caused by several factors, including poor risk management that leads to damage to assets, high maintenance cost, environmental damage, reduced production output, facilities and injuries. This research seeks to assess the implementation of Fault Tree Analysis for Mitigation of Equipment Failure in Nigeria. The various risk management techniques applied in Nigeria Liquefied Natural Gas (NLNG) Company at the event of the pandemic (Covid-19). The fault tree analysis (FTA) risk management technique as well as the extent to which it is implemented during the Pandemic and the challenges militating against the implementation of fault tree analysis (FTA) risk management technique in NLNG Company against the event of the pandemic transmission was assessed. Measures to mitigate the challenges faced by NLNG Company in effective implementation of FTA risk management technique against the events of the Pandemic transmission were provided. Descriptive survey and quantitative research method were employed to analyze the data of the responses generated from the structured questionnaires completed by employees in NLNG Company in Rivers State. Broad based for identification of various risk management techniques applied in NLNG Company against the event of corona virus transmission revealed about 57 percent of respondents believe the what-if method is the most reliable method of identifying risk in NLNG, while 39 percent believe Hazop is the most reliable method because it is a more detailed review technique used by the chemical and gas industries, and about 35 percent and 27 percent believe risk is identified through safety and other visualization. The result from the study for assessing the extent, to which fault tree analysis (FTA) risk management technique is implemented in NLNG Company against the event of corona virus transmission, revealed that RCA is often used and easy to use methods for more complete risk analysis, according to 80 percent to 100 percent of those polled. The next easiest and most commonly used tool is WHATIF analysis, which has been shown to have a 60 percent to 80 percent score test, followed by HAZOP, and FMEA, FMECA, FTA, and FISHBONE, which scored low on the aspect of "ease of use" tool in the NLNG Company based on the results of the survey collected. In the study, ten challenges militating against the implementation of fault tree analysis (FTA) risk management technique in NLNG Company against the event of corona virus transmission were investigated. Lack of expertise in techniques in oil and gas industry achieved the highest RII mean index (4.08). Lack of familiarity with techniques and nonexistence or not followed management of change procedures accounting for RII mean index of 4.02 is the second most important barrier, followed by lack of information and knowledge, flawed communication and reporting systems and lack of joint risk management mechanisms by parties representing mean index of 3.94 and 3.88 respectively. The result shows that experts still don't have adequate information in FTA risk management and techniques then training are necessary for FTA risk managing implementation. Conclusion and recommendation were made that, since those experts still don't have adequate information in FTA risk management technique then training and education of contractors and employees in oil and gas companies on using FTA risk management technique can be a useful way and best practice to improve the productivity of the industry.

Discovery, 2022, 58(320), 839-856

Study of Design of a Cost Effective Three-Phase Horizontal Separator for Optimization of Crude Oil Separation

Ukeje AE, Ukpaka CP, Uku Eruni Philip

The design of a three-phase horizontal separator for the separation of crude oil mixed with water into oil, water and gas has been developed. Design is a novel method in engineering, especially in chemical engineering for the sizing of equipment and specification. Here, a cost-effective horizontal separator was designed with parameters, values were obtained from the Tunu flow station SPDC. Design models were developed from first principles using material and energy balance. Also, cost, and mechanical design models were developed. The models for the design were simulated with Micro Soft Excel spreadsheet and results generated. The results for the designed separator indicated that the standard sizes and specifications of the horizontal separator gave sizes of effective length of the liquid capacity, seam-to-seam lengths for the gas and liquid, and slenderness ratio for the half full size respectively 6.63m, 8.46m and 8.84m, and 4.8, compared to values obtained for the size of the separator other than half full which was much higher values for sizes more than 0.5. The design considered the size of 0.8 full separator with results given as 8.29m effective length of liquid capacity, 10.12m and 11.05m seam-to-seam lengths of the gas and liquid capacities and 6.04m slenderness ratio, all at best diameter of the separator of 1828.8mm and at liquid droplet size of 100μm, drag coefficient of 2.1m occurring at Reynolds number 49.71 and terminal velocity of 0.101m/s. The economic evaluation of the plant (separator equipment) gave cost of equipment $10,098; fixed capital cost $5,000- annual operating cost $52,500; total variable cost $21,110; and total fixed cost $15,000. The mechanical design of the horizontal separator gave thickness of cylindrical shell 8.86mm and ellipsoidal heads of 8.81mm. The design results are good, reliable and can be adopted for use as it agrees with the research aim and objectives.

Discovery, 2022, 58(320), 857-873

Reliability of Valve Failures in Niger Delta Refinery Ltd Plant

Uku Eruni Philip, Ukpaka CP

Reliability on values were investigated with the effect of fluid flow on the rate of failures in Niger Delta Refinery plant. The obtained results demonstrates the ageing factors on constant failures of the values as well as the flow characteristics. Ageing factors reveals high cost of unreliability in terms of maintainability of the value especially when the failure is related to corrosion influence.

However, extensive investigation was conducted to examine the parallel connection of the values and how they affect the flow characteristics as well as induce the service time of the values in an operational plant that contains substances that are carries of agent of corrosive materials. This research work was able to address the significance of reliability engineering as a good tool in engineering management for optimum performance and productivity and safety of life and equipment by provide strategy for maintenance. The research on performance evaluation of the feed line components may not have been previously carried out by ND Refineries however; this research will contribute in improving the overall production capacity of distillation column plant through preventive and regular maintenance checks on the valves.

Discovery, 2022, 58(320), 874-892

SCIENCE

Floral biology and pollination of *Jasminum angustifolium* Willd. and *J. cuspidatum* Rottler (Oleaceae)

Suvarna Raju P, Solomon Raju AJ

J. angustifolium is a herbaceous vine while *J. cuspidatum* is a woody vine. The flowers of both species are hermaphroditic, dimorphic, distylous, fragrant and nectariferous. The sphind diurnal hawkmoths are the only visitors that collect nectar efficiently effecting pollination following flower-opening during late evening hours and they disappear from the flowers after sunset. The same hawkmoths appear collecting nectar again during dawn hours on the following day and disappear after sunrise. The carpenter bee, Xylocopa latipes is the only visitor that occasionally visits the flowers of both species during daytime. It could collect pollen from only pin flowers whereas this bee resorts to nectar-robbing by making punctures at the lower half of the corolla tube but it is known whether it successful to gather nectar or not. *J. angustifolium* flowers are highly fragrant than *J. cuspidatum* flowers; the former are used for hair adornments by women and also in religious offerings or rituals.

Discovery, 2022, 58(320), 893-897

Haematological and serum biochemical indices of broiler starter chicks fed diets containing different levels of aqueous *Citrus aurantium* stem bark extract

Alagbe JO, Jubril EA, Ramalan FL, Tanimomo MN, Azzezah Abdulrrauf-Babalola, Shittu MD

The aim of this experiment was to evaluate some haematological and serum biochemical indices of broiler starter fed diets having different levels of aqueous Citrus aurantium stem bark (CASR). A total of 200 - 1-day old broiler chicks (Arbo acres) were randomly distributed into 5 groups, each with 5 replicates consisting of 10 birds each in a completely randomized design. The study lasted for 21 days during which clean feed and water were provided ad libitum. Treatment 1 (T1) basal diet + Ciprofloxacin 0.2 mL/litre of water, T2 (basal diet + 10 mL/litre CASB), T3 (basal diet + 20 mL/litre CASR), T4 (basal diet + 30 mL/litre CASR) and T5 (basal diet + 40 mL/litre CASR). Results on haematological parameters showed that pack cell volume (PCV), haemoglobin (Hb), red blood cell (RBC), monocytes, eosinophils and basophils were not significantly($P>0.05$) different among the treatment while white blood cell (WBC), lymphocytes and heterophils were significantly ($P<0.05$) influenced by the treatments. Feeding birds CASR 10 mL to 40 mL/liters increased the WBC and lymphocyte counts. Total protein, albumin, globulin and creatinine values were similar across the treatments ($P>0.05$) while cholesterol and urea values decreases as the level of CASR increased across the treatments ($P<0.05$). It was concluded that CASR could be fed to broiler chicks up to 40 mL per liter of water without causing any deleterious effect on the blood profile of birds.

Discovery, 2022, 58(320), 898-906

Characterization of drought and its impact on agriculture in two tropical stations in Nigeria

Adaji JO, Ogolo EO

Characterization of drought indices in two tropical climates located in the derived Savanna and southern Guinean Savannah region of Nigeria (Lokoja, Kogi State and Minna, Niger State) using Standardized Precipitation and Evapotranspiration Index (SPEI) for a period of 33 years, (1975- 2007), and the impact of drought on their agricultural activities was investigated. Climatic data such as temperature, rainfall, and potential evapotranspiration obtained from the Climatic Research Unit (CRU) were analyzed with Microsoft excel. The Standardized Potential Evapotranspiration Index (SPEI) was analyzed with R programming language. The non-parametric Mann-kendall test was used to observe the trends of the climatic variables on an annual scale using SPSS. The Mann-Kendall test revealed that the correlation of the trend parameter was not significant for Lokoja but significant for Minna. The SPEI showed that near-normal drought condition was ubiquitous in the study areas. This paper concluded that drought events have hazardous consequences on agricultural activities in Lokoja and Minna.

Discovery, 2022, 58(320), 907-913

Proximate, phytochemical and heavy metal levels of selected ripened fruits sold in market outlets within Enugu metropolis, Enugu State, Nigeria

Okeke O, Aniobi CC, Akagha IC, Okoro MU, Nwosu D

Studies were carried out to evaluate the proximate, phytochemical and heavy metal levels of selected ripened fruits (paw-paw, banana and plantain) sold in market outlets within Enugu metropolis, using standard analytical procedures and instrumentation.

The parameters were evaluated in both the processed and control samples and were subjected to one way analysis of variance at 5% confidence level. The purchased ripened banana, paw-paw and plantain samples had 69.19± 3.96, 87.54± 4.20 and 79.54±1.72% respectively as moisture content compared to 58.71± 2.14, 74.66±3.01 and 70.71±3.01 % respectively obtained as moisture content in the control banana, paw-paw and plantain samples. The mean ash, protein, carbohydrate and vitamin C contents of the purchased banana, paw-paw and plantain samples were 1.71±0.21, 6.90±1.01, 8.84±2.11% ; 0.86±0.22, 0.67±0.18, 5.89±0.17% ; 2.34±0.54, 47.24 ±1.89, 40.81± 2.24 % and 11.11± 2.15, 31.12±0.34, 31.79±2.30 %, compared to 3.16±0.16, 7.61±0.46, 11.16±0.35% ; 1.24±0.39, 0.75±0.14, 6.82±0.33 % ;4.76±0.20, 50.66±3.41, 45.52±.46 % ; 16.02±1.49, 37.22±0.91, 25.21±2.71% gotten as mean ash, protein, carbohydrate and vitamin C contents in the control banana, paw-paw and plantain samples respectively. The mean moisture content was statistically higher in the investigated purchased samples than it was in the control samples. However, the mean ash, protein, carbohydrate and vitamin C contents of the control samples were higher than they were in the purchased samples. The mean flavonoids content in the control banana, paw-paw and plantain samples were 0.57±0.08, 0.87±0.26 and 0.43±0.06 mg/g respectively, but was 0.39±0.06, 0.66±0.10 and 0.38±0.02mg/g respectively in the purchased ripened banana, paw-paw and plantain samples. The mean alkaloids content in the control banana, paw-paw and plantain samples were 0.29±0.05, 0.93±0.09 and 0.32±0.05 mg/g respectively, but was 0.18±0.04, 0.85±0.06 and 0.20±0.04 mg/g respectively in the purchased banana, paw-paw and plantain samples. Lead was not detected in the control banana samples but was 0.02±0.01 and 0.12±0.05µg/g respectively in the control paw-paw and plantain samples. The mean Pb values in the purchased banana, paw-paw and plantain samples were 0.05±0.02, 0.10±0.04 and 0.33±0.08 µg/g respectively. Cadmium was not detected in the investigated control samples but had mean values of 0.07±0.02, and 0.15±0,03µg/g respectively in the purchased paw-paw and plantain samples. Although ripening agents generally accelerates the ripening of fruits to reduce economic loss due to possible decay, however, it could at the same time reduce the nutritive and phytochemical contents of the ripened fruits as was the suggested case with the investigated samples purchased from the market. The contaminant (heavy metal) levels of the purchased samples were equally found to be higher in the purchased samples than they were in the control samples.

Discovery, 2022, 58(320), 914-920

Ecological aspects of sexual reproduction in Stinking Passion Flower, *Passiflora foetida* L. (Passifloraceae)

Suvarna Raju P, Solomon Raju AJ

Passiflora foetida is an annual or perennial herbaceous climber. The flowers are large, hermaphroditic, nectariferous and fragrance with specialized bracts that protect the buds and flowers from florivores and also protect fruits during their maturation stage from frugivores while trapping insects for use as nutrients. The flowers are protandrous which promotes cross-pollination, but the flowers also display spontaneous autogamy. The plant is characteristically melittophilous with carpenter bees as the most appropriate and effective pollinators. The floral functional traits such as hermaphroditism, nectar production, tri-fid style movements, protandry and mixed mating system encourage both self- and cross-pollination in the presence or absence of pollen vectors and hence, these traits enable the plant to grow as a highly successful invasive weed mainly in tropical regions.

Discovery, 2022, 58(320), 921-925

SOCIAL SCIENCE

The long-run and short-run effects of price fluctuation on production of selected food grains in Nigeria (1981 – 2020)

La'ah D, Adaji DU, Ochoche CO

The study examined the long-run and short-run effects of price fluctuation on production of selected food grains in Nigeria (1981 – 2020). The data for this study were collected from secondary sources. The data was obtained from records of the National Bureau of Statistics (NBS), Food and Agriculture Organization Statistical Database (FAOSTAT) and annual reports. Data for this study were analyzed using Vector Error Correction Model (VECM) after testing for unit roots and cointegration among the variables using Augmented Dickey Fuller (ADF) and Johansen Co-integration Test, respectively. The result of the Augmented Dickey Fuller (ADF) test indicated that all the variables were found to be stationary on first differencing and Johansen co-integration mechanism indicated that there was co-integration among the variables. The result of VECM revealed that in the long run, the coefficient of rice price (0.000533) was statistically significant at 1% probability level; the coefficient of maize price (1115.509) was positive and statistically significant at 1% probability level while the coefficient of wheat price (4.728131) was positive and statistically significant at 1% probability level. The study concluded that prices of rice, maize and wheat have a positive and significant influence on the production or output of rice, maize and wheat in Nigeria in the long run. Therefore, an increase in prices of rice, maize and wheat increases the quantities that are being produced by the farmers in Nigeria. The study therefore recommended that efficient marketing systems should be put in place so that rice, maize and wheat farmers benefit directly from high prices of crops thereby serving as an incentive to engage in production in order to boost national output levels.

Discovery, 2022, 58(320), 926-934

Whistle Blowing Policy in Nigeria: Concerns for Organization Ethical Values

Abdulhafeez Salauddin, Adeboye Titus Ayinde

The high-profile media attention which whistle blowing has attracted in Nigeria in recent time underscores its relevance in organizations. However, employers seem to face a delicate situation arising from balancing the act with the potentials for whistle blowing in their organizations vis-a-vis the ethical values of the organizations. The article explored the whistle blowing practice within the confine of organizational ethical values. This is with a view to determining whether organizational ethical policy accommodates and provides necessary framework for whistle blowing. The paper discussed antecedents and purpose of whistle blowing, its practice in corporate and public organizations. Search light was also beamed on the character of whistle blowers and possible protective legal frameworks put in place for them. The article explored the possibility of synergy between whistle blowing practice and organizational ethical practice as well as implications for organisations. Deductions were made based on identified congruence of whistle blowing and organization ethical values. The paper thus concludes that employees in organizations with strict adherence to core ethical values are more inclined to whistle blow. Thus, organizations may do well if actively encourage whistle-blowing claims on unsanctioned and illegitimate practices by reaffirming commitment to ethical practices. Premised on the findings of this article, the study recommended that organizations should encourage strict adherence to core ethical values when adopting whistle blowing practice to prevent unjustified claims and unfair treatment.

Discovery, 2022, 58(320), 935-940