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For any discussion on research subject or research matter, the reader should directly contact to undersigned authors.

This research aims to: (1) create a mathematics Encyclopedia product for junior high schools, and (2) Determine the feasibility of a mathematical encyclopedia. Android can be used for various functions, one of which is for learning media. However, there are still few androids that are used by users, especially junior high school students for learning media. The stages of the research carried out refer to the ADDIE development model covering Analysis, Design, Development, Implementation, and Evaluation. The stages of the research that have been carried out are the analysis phase (goal analysis, curriculum and material analysis, analysis of the ability level and characteristics of the target users). Design (design of the items to be presented, preparation of material, preparation of material delivery flow in the form of flowcharts, making media storyboards, and the collection of materials needed in media development). Development (media making), implementation (assessment by media experts, material experts, and field practitioners as well as conducting limited trials), and evaluations (evaluations of developed media, done during the previous four stages). The subjects involved 21 students of class VIII as respondents. Feasibility test results were obtained 95% for media experts, 90% for material experts, 80% for field practitioners, and 83% for target users.

Procurement is recognised as a wider term than the mere purchasing of materials or services, based on specific requirements. Procedures and systems related to the procurement process does differ based on different countries, governments, sectors, organisations etc. but general consensus is that, the adopted process involves three (3) main stages identified as planning, purchasing and contract management. In the Sri Lankan health sector too, these key stages are prevalent in the procurement of medical equipment however, various concerns have arisen with regard to the timeliness of the current processes. Therefore, the objective of this study was to find out the factors affecting the timeliness of the medical equipment procurement process in the government health situations under the purview of the Regional Directorate of Health Services (RDHS) in Gampaha, Sri Lanka. This was a descriptive study done based on information gathered for the period of 2014/2015 related to the procurement activities of medical equipment at RDHS, Gampaha which, is the main health service provider for the second highest populated district in Sri Lanka. Two components were identified for the study and the first component was to obtain information of the procurement process from key stakeholders through self-administered questionnaire and informal interviews which, was more qualitative based. Second component was to scrutinise procurement records of medical equipment purchased in years 2014 and 2015, using structured fact sheets to gather necessary quantitative data. A total of 78 state sector health institutions are under the purview of RDHS, Gampaha and the officers at the Planning unit, Biomedical Engineering unit and Accounts branch are involved in buying the required medical equipment. Total study population was 65 and a heterogeneous sample of 28 individuals comprising of different categories of stakeholders were selected as respondents for the questionnaire to identify the qualitative aspect of the factors affecting the timeliness of the procurement process. Based on a total sample of 245 equipment categories a sample of 243 records were identified to obtain data of purchases done in 2014 and 2015. This study revealed that, several factors were affecting the orderliness and timely procurement of the requested medical equipment at three (3) key sub stages namely, (1) approvals; (2) equipment receiving and (3) technical evaluation of the process adopted by the officials at the RDHS in Gampaha. Some of the major influencing matters were, significantly a longer time period taken in the approval stage, unwarranted delays by the suppliers and also the issues relevant to the Technical Committee�s evaluation process. Whilst conducting this study, the researcher did obtain the candid opinion of the respondents in improving the overall process and ten (10) suggestions have been made for consideration, based on the analysis of collected data as well. It can be concluded that, greater consensus among all stakeholders along with stringent government guidelines, would enhance the efficiency of the medical equipment procurement process in the state health sector institutions in Sri Lanka.

This paper aims to (1) Determine the existence of central growth areas and support regions in the Mamminasata metropolitan area using scalogram analysis and centrality index. (2) Detect the amount of the interaction value between the supporting regions and the central growth area using gravity analysis. (3) To Know the effect of growth overflow between the growth centers and support regions using the intersection of the sides and corners of the region through the local index Moran and Moran scatterplot in spatial autocorrelation. The results of this paper show that (1) Makassar City as a growth centers with a hierarchy of 991.60; Maros, Gowa and Takalar Regencies with hierarchy each levels of 558.30, 591.60, and 558.30. The three districts are support regions in the Mamminasata metropolitan area. (2) The sequence of interactions to the city of Makassar with the total index of each district. Gowa (636) pull power I. Maros Regency (89) with pull power II, Takalar Regency (15) with pull power III. The city of Makassar is in quadrant II, while the three districts are supporting regions in quadrant IV. Makassar City has a negative growth effect or absorptive effect on the three supported districts in the period 2002-2016.

Optimisation Of The Production Parameters Of Delonix Regia Methyl Ester Using Box- Behnken Design

Adejumo, B. A, Agboola, J. B, Orhevba, B. A, Obasa, P. A, Simeon, M. I

The optimisation of the production parameters of Delonix regia ester was carried out with the view to establish the parameters for the production of optimum methyl ester yield from Delonix regia seed oil. The effects of reaction temperature, reaction time, alcohol: oil molar ratio and catalyst concentration as well as it interaction effects on the yield of methyl ester was investigated using the response surface methodology Box-behnken design. Data obtained were analyzed statistically using Design expect 9.0 statistical package to determine the response model, surface respond analysis of variance (ANOVA). The data collected from optimization of the reaction process was fitted to model. The results showed that the percentage yield in term of reaction temperature, time, molar ratio, concentration and interaction terms of reaction temperature and reaction time were significant ($p \leq 0.05$) while the lack of fit F-value for the Delonix regia methyl ester yield response showed that it was not significant ($p \leq 0.05$) relative to the pure error. This indicates that all the models predicted for methyl ester yield response were adequate. Regression models for data on response methyl ester yield were significant ($p \leq 0.05$) with satisfactory R2 value of 0.829. The boundaries of the design intergalactic of methyl ester yield have the lowest value at 72 % within the process range of 40 0C to 56 0C for Temperature, 30 to 53 minutes for Reaction time, for all production processes while the highest of 90.21 % with the process boundary range of 55 to 60 0C for A: Temperature, 40 to 60 minutes reaction time. The optimization solution gave the process conditions for each process factors at the highest desirability prediction of 0.642 as best reaction temperature of 53.200C and the reaction time of 60 minutes, alcohol: oil molar ratio of 2:1 and catalyst concentration of 0.69% when the set goal is based on the physic-thermal properties of produced methyl ester.

[View Full Paper] **2036-2043**

Workers In The Namlea Market

Riki Bugis, Said Abdurahman Assagaf, Abdussabar Polanunu, Edy Said Ningkeula, Wilda Fesanrey, Lukman Ismail, M Chairul Basrun Umanailo

Rongo-Rongo is a woman who is thinking of goods in the market Namlea Buru District. As a service provider of the goods, Rongo-Rongo will assume every item purchased by consumers and deliver where the consumer is shopping. Work with full risk and susceptible to health elements does not prevent them to continue activities and actions that are carried out to be a woman's existence in fulfilling the needs of the family economy. This research is a qualitative study aimed at describing the existence of Rongo-Rongo in fulfilling household needs. The research location is focused on Karang Jaya Village, Namlea Market and Namlea Terminal with consideration of informant activity scope. The number of informers interviewed 25 people, 15 Rongo-Rongo, 1 Market manager, 1 Terminal manager, 3 community leaders, 3 members of the Rongo-Rongo family and 2 village apparatus. Analytical techniques used to follow the concept of Miles and Huberman where activities in the analysis of qualitative data are conducted interactively and continuously. The results showed that the existence of Rongo-Rongo becomes the main pillar in the source of household livelihood, efforts to fulfill the needs of the household is done by prioritizing physical strength without thinking of bad risk to health. In addition, to cover the shortage of needs rongo-Rongo also doing activities outside the main work is by clearing shops or providing clean laundry services and processing agricultural products.

[View Full Paper] **2044-2047**

DSS For Scholarship Recipients Using The Fuzzy C-Means Clustering Integrated With The Simple Additive Weighting Method

Nunik Destria Arianti, Sardjoeni Moedjiono

Determination of scholarship recipients is a very subjective and complicated thing to do without using information systems. Therefore, this paper presents the development of a decision support system for determining scholarship recipients using the fuzzy c-means clustering (FCM) method with the integrated, simple additive weighting method conducted at the College of Technology Nusa Putra. The assessment is conducted by determining the grouping, which then calculates the XB (Xie-Beni) index for each cluster that has been formed. From these calculations, it is known which group is the best that can be used as an alternative for decision making. The ranking process of each cluster determines the optimal option of the best prospective student scholarship recipients. The results of this study indicate that scholarship recipients at the College of Technology Nusa Putra are more objective and make more precise and efficient decisions.

[View Full Paper] **2048-2050**

ISSK- An Integrated Self Service Kiosk For Health Monitoring And Management

N. Komal Kumar, Dr. R. Bhavani, Dr. A. Mohan, D. Vigneswari

India has a huge population of around 1.35 billion people. 80% of India lacks in health infrastructure, medical manpower and other health resources. Approximately 40% of the Population suffers from lifestyle-related diseases (Non Communicable disease NCD) like Hypertension, Diabetes, Obesity, Low nutrition, cardiovascular diseases, and Chronic Respiratory problems. The aim of our work is to provide effortless scalable preventive care solution by keeping tracking of few vitals medical parameters like Blood Pressure (BP), BMC, Body Mass Index (BMI), Electrocardiogram (EKG), Pulse and Weight. FDA compliant test measurements with high test accuracy and sensitivity to measure your vitals in the quickest and most efficient way. A network of easy screening healthcare kiosks all around the Country, log in from anywhere, any-time, and keep control of your health. No more paper records all over the country. Your personal health records and data all in one place.

[View Full Paper] **2388-2393**

Optimisation Of The Production Parameters Of Delonix Regia Methyl Ester Using Box- Behnken Design

Adejumo, B. A, Agboola, J. B, Orhevba, B. A, Obasa, P. A, Simeon, M. I

Abstract: The optimisation of the production parameters of *Delonix regia* ester was carried out with the view to establish the parameters for the production of optimum methyl ester yield from *Delonix regia* seed oil. The effects of reaction temperature, reaction time, alcohol: oil molar ratio and catalyst concentration as well as it interaction effects on the yield of methyl ester was investigated using the response surface methodology Box-behnken design. Data obtained were analyzed statistically using Design expect 9.0 statistical package to determine the response model, surface respond analysis of variance (ANOVA). The data collected from optimization of the reaction process was fitted to model. The results showed that the percentage yield in term of reaction temperature, time, molar ratio, concentration and interaction terms of reaction temperature and reaction time were significant ($p \leq 0.05$) while the lack of fit F-value for the *Delonix regia* methyl ester yield response showed that it was not significant ($p \leq 0.05$) relative to the pure error. This indicates that all the models predicted for methyl ester yield response were adequate. Regression models for data on response methyl ester yield were significant ($p \leq 0.05$) with satisfactory R^2 value of 0.829. The boundaries of the design intergalactic of methyl ester yield have the lowest value at 72 % within the process range of 40 ^{0}C to 56 ^{0}C for Temperature, 30 to 53 minutes for Reaction time, for all production processes while the highest of 90.21 % with the process boundary range of 55 to 60 ^{0}C for A: Temperature, 40 to 60 minutes reaction time. The optimization solution gave the process conditions for each process factors at the highest desirability prediction of 0.642 as best reaction temperature of 53.20^{0}C and the reaction time of 60 minutes, alcohol: oil molar ratio of 2:1 and catalyst concentration of 0.69% when the set goal is based on the physic-thermal properties of produced methyl ester.

Keywords: Alcohol, Catalyst, Delonix regia, methyl ester, temperature, time

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1.0 INTRODUCTION

The problem of continuous fossil fuel depletion and environmental pollution is of great concern all over the world [1], [2], [3], [4]. The excessive use of fossil fuel globally has resulted in environmental degradation such as the green house effect, ozone layer depletion, climate change, acid rain among others [5], [6], [1]. The possible solution to this worldwide petroleum problem is the use of biodegradable product. A lot of research has been carried out to produce environmentally friendly alternative sources of energy to replace the fossil fuel [7], [8], [9], [10]. Biofuels produced from food crops and seed oil that can be used as an alternative to fossil fuel has been reported. Biofuels are solid, liquid or gaseous fuel produced from biorenewable feedstock [8], [11]. Liquid biofuels are potential and important replacement for the fossil fuel; the major biofuels are bioethanol and biodiesel [12]. Biofuel are none polluting, environmentally friendly, locally available sustainable and security of continuous supply and many benefits for the economy and consumers [12], [13], [9], [14], [15].

Biodiesel is considered as relevant technology for developing and industrialised countries [16], [17]. It has been reported that biodiesel is far more soluble than petroleum diesel enabling marine animal to survive higher concentration than petroleum fuel if spill occurs [18], [19]. Biodiesel results in lower emission of most pollutants relative to diesel [20]. The various products of vegetable oil and its mixtures with diesel have been used as alternative for fossil fuel [15], [16]. It has been reported that for vegetable oils or its mixture used, there is the need to modify the engine due to its unsuitable properties such as the ignition qualities and viscosity [16], [17] or to process the oil so as to modify its undesirable properties [18], [19]. The process by which these undesirable characteristics of vegetable oil can be modified to make it suitable for use in existing diesel engines is called

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esterification [19]. Esterification process is carried out when oil has high FFA; the process is done by the use of acid catalyst and alcohol with the aid of vacuum distillation and stirring over a period of time in a reactor [20]. Transesterification process is the process of producing ester, by using alkaline catalyst and alcohol for the reaction process. Production of ester requires good separation techniques during production process in order to prevent chemical bond chain brake, the process separate glycerol and ester. Ester separation can simply be done by the use of separating funnel [21], [22]. However, the use of vegetable oil for the production of biodiesel has not economical due to the high competition for its use for human consumption and cost of production, hence the need to use non edible oil. In an attempt to reduce the cost of biodiesel, various researches has been carried out using seed oil such as jatropha, coconut, bitter almond, palm oil, soybean, citrus seed, peanut, *Delonix regia* etc [16], [18], [20], [22], [23], [24], [25], [26], [27], [28], [29], [30]. The factors that influence the yield of biodiesel are the catalyst concentration, alcohol: oil molar ratio, reaction temperature and time. Hence the aim of this work is to optimise the reaction process in the production of biodiesel from *Delonix regia* seed oil with a view to increase desirable quality biodiesel yield.

2.0 MATERIALS AND METHODS

The *Delonix regia* seed oil was filtered using a cartilage filter to remove debris and the oil was heated at 100^{o}C for 1hour in order to remove any water molecules. The oil was then cooled and stored in sealed plastic bottles until required. The esterification process was carried out using two litre (2L) of *Delonix regia* oil which was measured and transfer into a beaker. Five hundred millimetre of (500 ml) methanol and ten millilitre (10ml) (5 % v/v) sulphuric acid were measured and mixed in a beaker. The temperature of the oil was raised to 55°C via hot plate after which the methanol-acid mixture was added. Mechanical stirrer set at 300 rpm was inserted into the beaker containing the mixture and the reaction temperature was maintained at 50°C. After 30 minutes of reaction time, the product was poured into a separating funnel and allowed to settle for 12 hours after which two separate layers were obtained [19], [20], [28]. Separation and washing of the top layer was done with warm water. The process was repeated for all the oil samples. Transesterification of esterified *Delonix regia* seed oil was conceded with methanol in the presence of catalyst (KOH) [24], [25], [29], [22]. Reactions were conducted in batches at different Temperature, Time, Alcohol: Oil molar ratio and Catalyst Concentration based on the experimental design matrix (Table 1).

Table 1. Experimental design for the optimization of the Transesterification reaction process for biodiesel production

Runs	A	B	C	D
1	60	45	5	1.00
2	60	45	8	0.75
3	60	45	5	0.50
4	50	45	2	0.50
5	50	45	5	0.75
6	40	60	5	0.75
7	50	60	2	0.75
8	40	45	8	0.75
9	60	30	5	0.75
10	50	45	5	0.75
11	50	45	5	0.75
12	50	45	8	0.50
13	50	45	5	0.75
14	40	45	5	1.00
15	50	45	5	0.75
16	50	60	5	0.50
17	50	30	8	0.75
18	40	30	5	0.75
19	50	30	2	0.75
20	50	30	5	1.00
21	50	60	8	0.75
22	40	45	5	0.50
23	50	45	2	1.00
24	50	30	5	0.50
25	60	60	5	0.75
26	40	45	2	0.75
27	50	60	5	1.00
28	60	45	2	0.75
29	50	45	8	1.00

Where:

A= Factor 1: Temperature (^{o}C)

B = Factor 2: Time (Minutes)

C = Factor 3: Alcohol:oil (Molar ratio)

F = Factor 4: catalyst concentraion (%)

This mixture was poured into the reactor and placed on an electric mixer and mechanical stirrer. The stirring speed was maintained at 300rpm. After the reaction process the contents were allowed to cool at ambient air condition. This reactant was then poured into a separating funnel and separation was allowed to take place under gravity for 12hours. The *Delonix regia* methyl ester which is the biodiesel was found floating on top while the denser glycerine, excess alcohol, catalyst, impurities and traces of un-reacted oils settled at the bottom of the funnel. All experiments were carried out using the response surface methodology, Box-behnken experimental design. Data obtained were analyzed statistically using Design expect 9.0 statistical package to determine the response model, surface respond analysis of variance (ANOVA). The data collected from optimization of the reaction process was fitted to model. Developed model from the factor interaction and model validation was analysed. In establishing a model for a particular process, $Y = \beta_0+\beta x_1+ \beta x_2 + \beta x_1 x + \beta x_1^2+ \beta x_2^2 + \beta x_1^2 x_2 + \beta x_1 x_2^2 + \beta x_1^3 + \beta x_2^3+$ £. The validity of that model in predicting the output of a process is essential as its relevance depends to a large extent on its accuracy. In this study, the validity of Response Surface Methodology (RSM) as a modelling and optimization tool is determined by developing linear, two factor interactions, quadratic, cubic models to show a model that best fit the experimental result by conducting robustness test using R-square value (R^2), Adjustable R-square, Root Mean Square Error, Predicted R-square value, Adequate Precision, Predicted Residual Sum Square (PRESS) and Coefficient of Variation %.

3.0 RESULTS AND DISCUSSION

The results of the percentage methyl ester yield from *Delonix regia* seed oil as influenced by the processing parameters of temperature, time, alcohol:oil molar ratio and catalyst concentration are as presened in Table 2. The highest yield of methyl ester yield of 90.21% was obtained when produced at 50^{o}C, 60minutes, 8:1 alcohol:oil molar ratio and 0.75% catalyst concentration while the lowest yield of 72.30% was obtained at 50^{o}C, 45 minutes, 2:1 alcohol:oil molar ratio and 1.00% catalyst concentration.

Table 2: Delonnix regia Methyl ester yield as influenced by production parameters

Runs	A	B	C	D	%yield
1	60	45	5 : 1	1.00	73.80
2	60	45	8 : 1	0.75	82.00
3	60	45	5 : 1	0.50	78.00
4	50	45	2 : 1	0.50	76.91
5	50	45	5 : 1	0.75	78.54
6	40	60	5 : 1	0.75	82.00
7	50	60	2 : 1	0.75	80.40
8	40	45	8 : 1	0.75	74.31
9	60	30	5 : 1	0.75	84.00
10	50	45	5 : 1	0.75	78.00
11	50	45	5 : 1	0.75	83.40
12	50	45	8 : 1	0.5	81.00
13	50	45	5 : 1	0.75	78.80
14	40	45	5 : 1	1.00	72.00
15	50	45	5 : 1	0.75	77.90
16	50	60	5 : 1	0.50	86.30
17	50	30	8 : 1	0.75	78.00
18	40	30	5 : 1	0.75	72.81
19	50	30	2 : 1	0.75	74.00
20	50	30	5 : 1	1.00	76.90
21	50	60	8 : 1	0.75	90.21
22	40	45	5 : 1	0.50	74.80
23	50	45	2 : 1	1.00	72.30
24	50	30	5 : 1	0.50	75.00
25	60	60	5 : 1	0.75	89.20
26	40	45	2 : 1	0.75	72.50
27	50	60	5 : 1	1.00	87.20
28	60	45	2 : 1	0.75	84.13
29	50	45	8 : 1	1.00	79.38

Where:

A= Factor 1: Temperature (°C)

B = Factor 2: Time (Minutes)

C = Factor 3: Alcohol:oil (Molar ratio)

F = Factor 4: catalyst concentraion (%)

The quadratic regression coefficient was obtained by engaging a least squares method technique to predict quadratic polynomial models for the *Delonix regia* methyl ester percentage yield (%). The yield% process term of reaction temperature, time, molar ratio, concentration and interaction terms of reaction temperature and reaction time were significant ($p \leq 0.05$) while the lack of fit F-value for the *Delonix regia* methyl ester yield response showed that it was not significant ($p \leq 0.05$) relative to the pure error. This indicates that all the models predicted for the *Y* response were adequate. Regression models for data on response methyl ester yield were significant ($p \leq 0.05$) with satisfactory R^2 value of 0.829, however, the model was significant. The Response Surface Methodology (RSM) was carried out using the Box-behnken design. The Box-behnken design is one of the best ways of evaluating the relationships between responses, variables and interactions that exist by duplicating for every combination of categorical factor levels. The relationships between independent and dependent variables are shown in the three-dimensional-representation as response surfaces Figure 1 and in a contour plot Figure 2, curves of equal response values are drawn on a plane whose coordinates represent the levels of the independent factors. Each contour represents a specific value for the height of the surface above the plane defined for combination of the levels of the factors. Therefore, different surface height values enable one to focus attention on the levels of the factors at which changes in the surface height occur in the experiment. The variable response based on the Response Surface Quadratic Model terms that are statistically significant are as plotted in Figure 1. The plot shows interaction A: Temperature, B: Reaction time, while holding Oil-Alcohol molar ratio at 5:1 and Catalyst concentration at a constant level of 0.75%. The boundaries of the design intergalactic of methyl ester yield have the lowest value at 72 % within the process range of 40 ^{0}C to 56 ^{0}C for A: Temperature, 30 to 53 minutes for B: Reaction time, for all production processes while the highest *Delonix regia* methyl ester produced at 90.21 % with the process boundary range of 55 to 60 ^{0}C for A: Temperature, 40 to 60 minutes reaction time (Figure 2). The other factors of interaction showed lower *Delonix regia* methyl ester yield responds boundary plots Figures 3 to Figure7 except the factor interaction of time and alcohol:oil (molar ratio) (Figure 5) which showed the boundary to achieve high yield of *Delonix ragia* methyl ester yield at 52.50 to 60 minutes reaction time with molar ratio of 5:1 to 6:1 which is similar to previous studies carried out on some non-edible seed oil [19], [22], [28], [29].

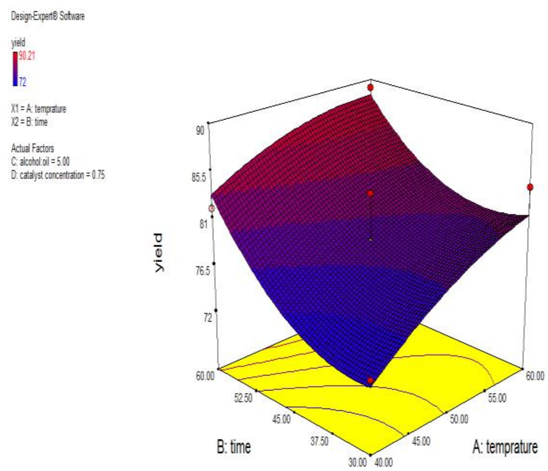

Figure 1: 3-D response surface plot of temperature and time effect on Delonix regia methyl ester yield.

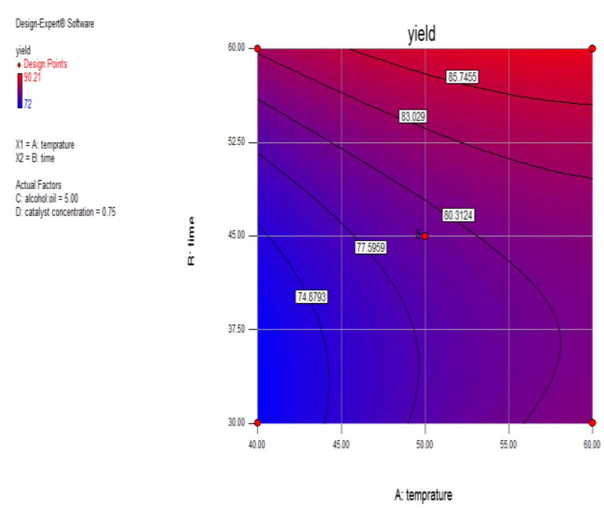

Figure 2: Contour plot of temperature and time effect on Delonix regia methyl ester yield.

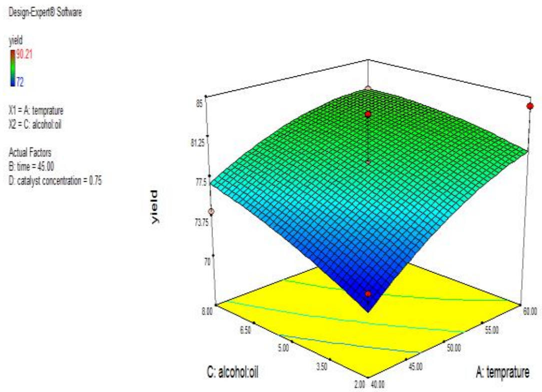

Figure 3: 3-D response surface plot of temperature and alcohol: oil (molar ratio) effect on Delonix regia methyl ester yield.

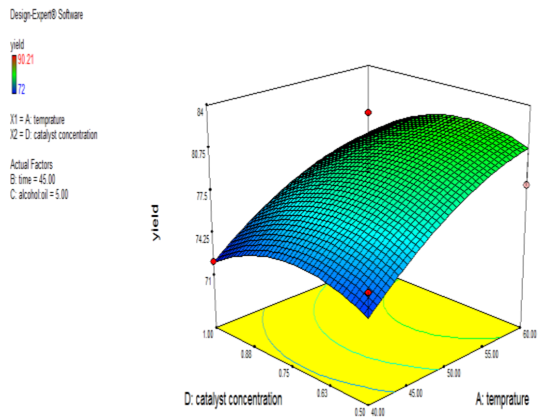

Figure 4: 3-D response surface plot of temperature and catalyst concentration effect on Delonix regia methyl ester yield.

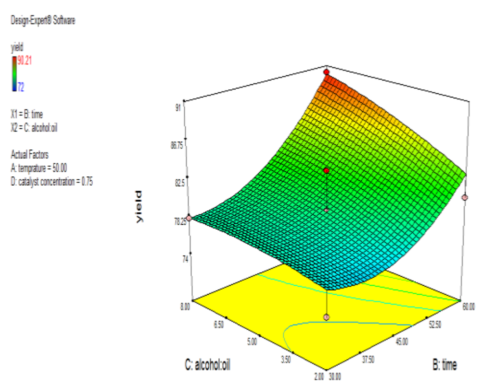

Figure 5: 3-D response surface plot of time and alcohol: oil (molar ratio) effect on Delonix regia methyl ester yield.

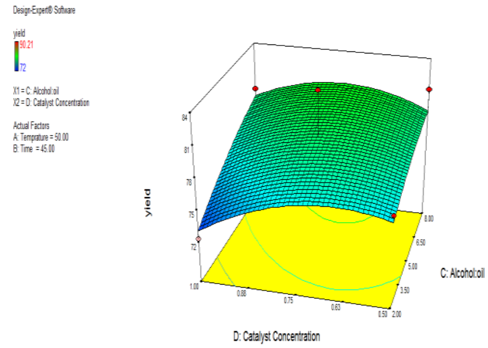

Figure 6: 3-D response surface plot of alcohol: oil (molar ratio) and catalyst concentration effect on Delonix regia methyl ester yield.

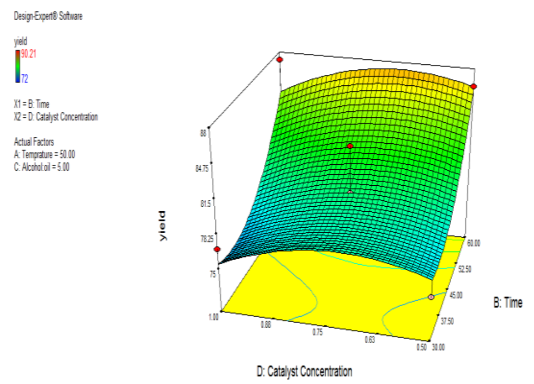

Figure 7: 3-D response surface plot of time and catalyst concentration alcohol: oil (molar ratio) effect on Delonix regia methyl ester yield.

Optimization process

Numerical Optimization analysis carried out on the produced *Delonix regia* biodiesel by setting goals on the investigated physic-thermal properties of the produced based on the experimental design matrix of the *Delonix regia* methyl ester. The desirable qualities of biodiesel include minimum value of moisture content, pour point, cloud point and viscosity (kinematic and dynamic) with maximum values of methyl ester yield, density, smoke and flash point; hence the best set objectives of each these parameters (maximum, minimum and within range) of *Delonix regia* methyl ester was investigated and the responses are as presented in the overlay plot in Figure 8. The optimization best four solution give the process conditions for each process factors at the desirability prediction values, the selected condition with reference to the highest desirability prediction of 0.642, (Table 3) revealed the best reaction temperature of 53.20^{0}C and the reaction time of 60 minutes, alcohol: oil molar ratio of 2:1 and catalyst concentration of 0.69%.

Table 3: Numerical Optimization Desirability solution for Delonix regia biodiesel

S/No	A	B	C	D	Desirability
1.	53.20	60.00	2.00	0.69	0.642
2.	53.74	59.96	2.00	0.70	0.641
3.	52.17	60.00	2.00	0.68	0.641
4.	52.20	60.00	2.00	0.67	0.640

Where:

A= Factor 1: Temperature (oC)

B = Factor 2: Time (Minutes)

C = Factor 3: Alcohol:oil (Molar ratio)

F = Factor 4: catalyst concentraion (%)

The boundary for maximum yield of *Delonix regia* biodiesel when considering two interaction molar ratios 5:1 to 6:1 and set goal based on the physicochemical properties of produced methyl ester. This study gives more realistic conditions for the production of methyl ester from *Delonix regia* seed oil not only in terms of yield but also terms of desirable physic-thermal qualities.

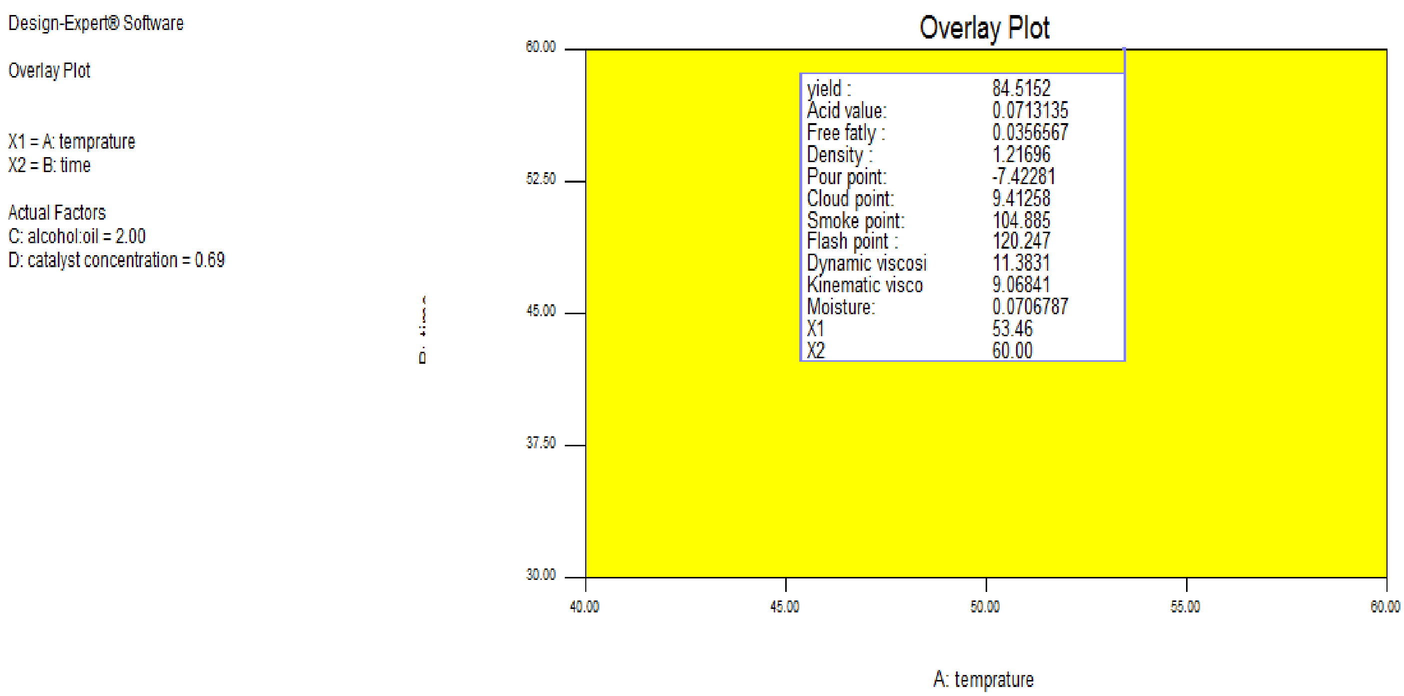

Figure 8: Graphical ovelay plot of set goal for optimization process.

Conclusion

It is concluded that *Delonix regia* methyl ester with the highest desirability prediction of 0.642 in terms of minimum moisture content, cloud point, pour point and viscosity with maximum yield of 84.50% can be produced at 53.20^{0}C reaction temperature, 60 minutes 2:1 alcohol: oil molar ratio and 0.69% catalyst concentration.

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