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Production of Grease using Palm Bunch

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ABSTRACT

This research work showcase the production of Bio grease using different species of oil palm bunch obtained in Niger Delta Area of Nigeria. The three different species used were *Pesifera* species, *Tenera* species and *Dura* species. The experimental analysis result on the characteristics of the samples revealed the following concentration on the various element sampled. Pesifera species values are Calcium Ca (116.91mg/c), phosphorus P (102.30mg/c), Lithium Li (10.15mg/c), Sodium Na (102.80mg/c) and Aluminum Al (82.24mg/c). Whereas for Tenera species we have Calcium Ca (128.62mg/c), phosphorus P (110.71mg/c), Lithium Li (17.57mg/c), Sodium Na (130.26mg/c) and Aluminum Al (150.17mg/c). Whereas for Dura species we have Calcium Ca (100.21mg/c), phosphorus P (97.10mg/c), Lithium Li (8.18mg/c), Sodium Na (97.10mg/c) and Aluminum Al (82.24mg/c). The compounds identified are fluorenthene, fluorine, chrysene, Anthracene, Acenaphthene, Benz (o) pyrene, Benzo (g,h) perylene, Accepthylene, Benzo (b) fluorenethene, Indeno (1,2,3, -cd) pyrene, Benzo (k) fluoranthene, naphthalene, phenanthrene Benzo (a) anthracene, Dibenz (a) anthracene and pyrene. The result obtained also revealed the presence of the following compounds in grease produced from the three different species of the oil palm bunch used in this research work. This research work demonstrated the usefulness of palm bunch in the production of grease.

Key words: Palm bunch, soft, hard, grease, production, characteristics

1. INTRODUCTION

Indeed, the needs to source materials that are environmental friendly is necessary for purpose of safeguarding the ecosystem. Today most of materials are petroleum based products especially the high density polyethylene (HDPE) as well as low density polyethylene (LDPE), since most of these materials are useful in terms of thickening agent as well as synthetic oil [1-4].

In soap production the thickening agents are significant to the process and such agents are aluminum, calcium and sodium lithium as well as found useful in production of grease [5-6]. In soap production the following characteristics are need such as alkaline hydrolysis involving fat and oil and the process is called saponification and the reaction methods are demonstrated in equation (1) and (2) below

$$C_3H_5 \text{ —— } (00CR)_3 + 3NaOH \longrightarrow 3NaOOCR + C_3H_5OH \quad (1)$$
(Fat) (sodium hydroxide) (Soap) glycerol

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$C_3H_5(OOCR)3 + 3KOH \longrightarrow 3KOOCR + C_3H_5OH$ (2)

(Fat) potassium Hydroxide soap glycerol

The soap obtained based on equation (1) and (2) expressed different properties when used in the production of grease. The reason is that different composition and concentration will be achieved as well as different structure. However, the thickening agent will influence the characteristics of the grease obtained [7-8].

Research conducted on grease obtained from alkaline reveals that ashes from plantain peels can be used in the production of local soap, which can be further purified to achieve a quality with addition of all required reagent [9-11]. Indeed, various agricultural materials are useful and can be used as a raw material for soap production as well as further processing leading to grease especially when the composition of the raw materials contains constituent for grease production [12]. Research reveals that these agricultural products are commonly available in Nigeria. However, the common equation describing the possible method are demonstrated in equation (3) and (4) below.

$Na_2O + H_2O \longrightarrow 2NaOH$ (3)

$K_2O + H_2O \longrightarrow 2KOH$ (4)

Agricultural waste has been discovered to be a cheaper and readily available source of soap production and other alkalis-based products [11]. The availability of these raw materials in the southern part of Nigeria and at a relative cheaper rate gives us the concern to seek to put waste by-products to good use and also solving the problem of waste disposal, hence converting waste to health [12-13]. Therefore, in this research we have made attempt to turn this palm bunches that are available in Nigeria in addition with relevant grease making additives to produce a multi-purpose grease [14].

Nowadays, the petroleum prices are increasing almost every day. One of the factors is because of the decreasing oil reserves and the hike in crude oil prices [15].Alternative sources of grease production and at a low cost have to be looked into. However, scientists and engineers are looking for alternative use of some of our Agro-by products and have resorted to conducting researches as to how grease can be manufactured using Agricultural waste such as Palm Bunch. [16]

In order to encourage local participation in reviving and ensuring the continued diversification of the economy by the Federal Government of Nigeria, local content board was established. [17]

Therefore, we wish to research in this area of grease production using palm bunch ash an agro based material by product that is in great abundance in Nigeria for the production of thickener as a component for grease production [18]. The aim of this research work is to examine the quality of grease produced from palm bunch using three different species. It is crucial and timely for this reassess in our nation in order for researchers to find out alternative means for grease production by the use of local raw materials. However, the research demonstrates the palm bunch application in grease production and in most nation palm bunch is considered as an agricultural waste based materials. Indeed, this research has illustrated the significance of palm bunch as a useful material for grease production especially when process for manufacturing is strictly followed and all reagents added based on the process conductions.

2. MATERIALS AND METHODS

Materials

The Materials utilized for this research includes: Sack bags, Laboratory oven Thermometer, Weighing balance, Beaker, Pot (Reactor) Stirrer, Paper cellotape, Plastic buckets, Stop watch, Thermocup, PH meter, Electronic Weighing Scale, Crucible , Dessicator.

Reagents:

The following are some of the materials used as reagents for grease production are - Na_2CO_2, Oleic acid, Mineral oil, Sodium silicate, Distilled water and Stearic acid.

Sample Preparation

The palm bunch ashes were analyzed using the following systematic method.

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Heating:

In order to reduce the moisture content present in the palm bunch the laboratory oven was used to heat the materials at a required temperature.

Burning:

The burning of the palm bunch was done by subjecting the material in the oven under a controlled temperature. The oven was able to burn the material into finely powdered Ash.

Sieving:

Sieving of the finely powdered particles of palm bunch ash was done using a 150-micrometer sieve.

Procedure of Palm Bunch Extract

The following methods were followed; it includes all steps and procedure for the extraction of palm bunch.

1. Sample (palm bunch) were collected from Bayelsa palm Elebele, packaged in a bag and brought to the laboratory.
2. The palm bunch was sundried for about 7 weeks to reduce moisture content
3. The samples were transferred into the laboratory oven that was set to 70°c in order to dry the samples and make it loss all it moisture content
4. The samples were brought out of the laboratory oven, the sample appeared collectively dried and thus indicating the absence of the water content in it
5. The ash sample was placed in a weighing balance by placing the ash samples into the lower foil and it was discovered to weigh 30g
6. 2kg of the ash sample was measured using weighing balance.
7. The ash sample was introduced into ten litres of rubber of distilled water, the mixture was thoroughly stirred for a period of 30 minutes to enable even mixing of the product.
8. The sample was allowed to settle for about 3 hours then the filtrate was decanted to get the extract
9. 500ml of the filtrate was introduced into a reactor.

Raw Material Mixing for the Formulation of Grease from Palm Bunch Extract

400ml of the palm extract was weighed out and also 150g of sodium silicate was dissolved in 400ml of the extract and stirred continuously, both were heated to a temperature of 100°c in a reactor, the product is allowed to cool for about1 hour 30 mins, then the solution is filtered out using a filtering paper, the filtrate was introduced into the reactor, then 500ml of mineral oil was introduced in the reactor with continuous heating this action is followed by continuous stirring. 150g of stearic acid was introduced into the solution and stirred continuously this is followed by heating, 150g of Oleic acid was also introduced in at a temperature of 110°C and stirred continuously. 150g of sodium carbonate was finally introduced with continuous heating to a temperature of 150°C then a jelly like substance was notice which is now the lubricating grease, the solution is allowed to cool at room temperature and grease was formed but the product was hard. Then the process was repeated and some variation were made to improve the end product.

All the solid reagents were dissolved in warm water (sodium silicate, stearic acid, sodium carbonate 500ml of the palm extract and 250g of sodium silicate was mixed and stirred continuously. Both were heated to a temperature of 70°C in a reactor and was left for cooling for about 1 hour then the solution was filtered out using a filtering paper, the filtrate was introduced into the reactor then 400ml of mineral oil was introduced into the reactor with continuous heating. 250g of stearic acid was introduced into the solution with continuous stirring and 250g of oleic acid was introduced at a temperature of 120°C and stirred continuously and lastly 250g of sodium carbonate was finally introduced with continuously heating of 150°C then a jelly like substance starts forming which is the lubricating grease when it was cooled at room temperature.

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This procedure was done for the three species of palm bunch as presented in Figure 1 below:

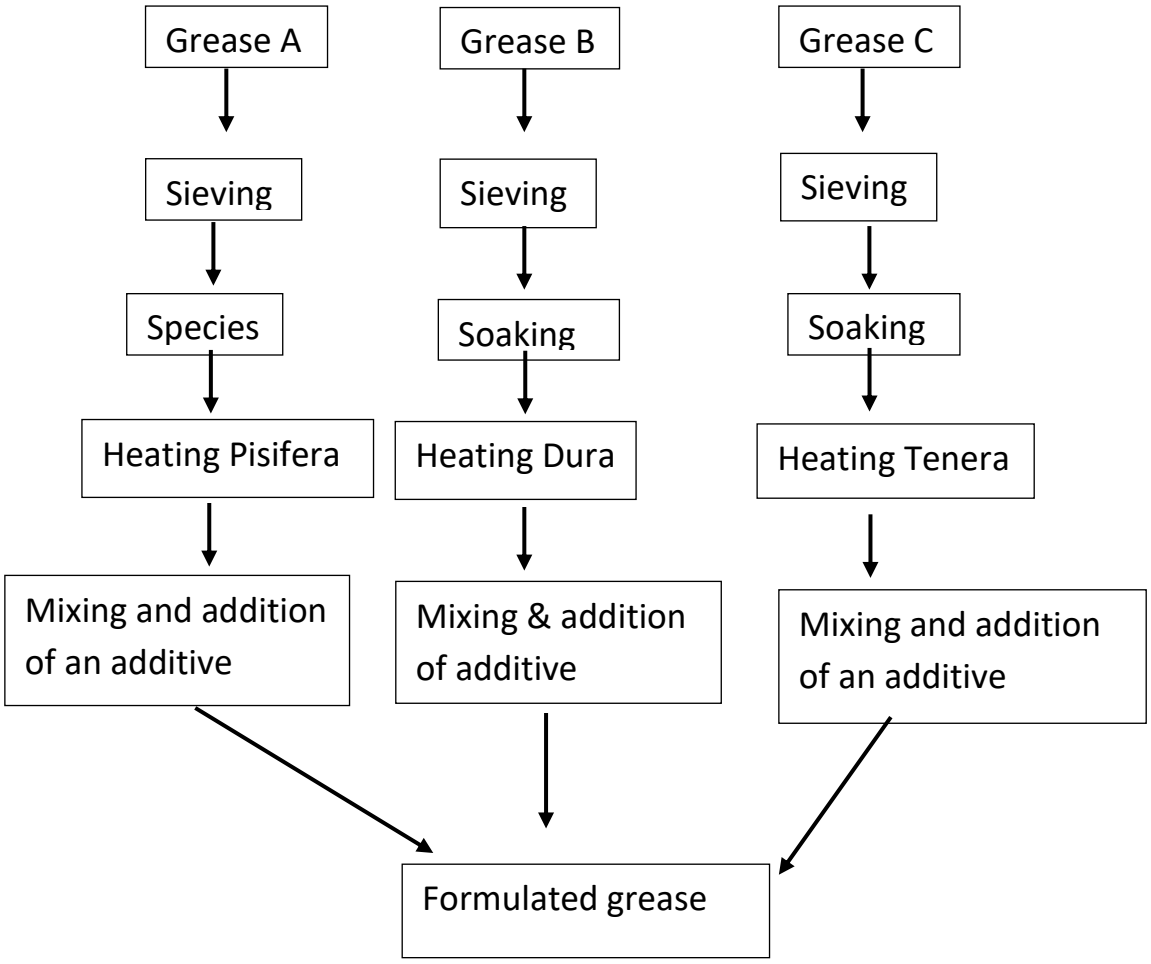

Figure 1: Experimental Procedures of the three palm Bunch species used in the investigation

Preparation of Control Samples

This research involve the use of NLGI #O base polymer and the Bexco material was obtained in terms of control sample which was analyzed. The NLGI #O of sodium base was obtained and considered as sample for control and was subjected to analysis. The focus of this sample obtained is for comparison of the Bexco type of NLGI #~~-O~~ of polymer base with others.

Consistency Test

The ASTM D217-02 technique was applied as a standard methods for testing the degree of cone penetration in terms of lubricating grease characteristics and the penetration level is expressed by considering the millimeter trend value on it.

Unworked Penetration Test

Three samples of the grease were subjected to the penetration test. They had their different penetration levels measured using penetrometer by filling in a grease cup. Which is cylindrical in shape with 50ml capacity with a little disturbance, the surface was smoothened and placed on the penetrometer assembled and pressed for five seconds during which a cone on the assembly has its tip just touching the level of the grease surface at the start. The distance dropped for each sample was read from the dial indicator of the penetrometer and recorded.

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Worked Penetration Test

The worked penetration test concept was the same when compared with the unworked penetration, but the slight difference was attributed to grease of this samples were pretreated before subjecting the 60 double strokes into work load of elevated temperature range.

Dropping Point Test

The dropping point was examine by using the ASTM approach of testing with standard concepts of D-566 and D-2265 techniques which includes:

1. The necessary apparatus required includes: electrical heater, thermometer, test tube, grease cup made of small hole at the bottom.
2. The internal surface of the grease cup was coated and grease subjected into the cup and then analysis was carried out. In this concept thermometer was immersed inside without the grease having contact with the thermometer. The procedure allows the test tube to be lowered in the container and the container was then filled with oil and after this stage another thermometer was immersed into the process unit containing the oil.
3. The oil in the process unit was heated as well as stirred until a uniform concentration was obtained at a temperature of 100^{O}C. The process unit was allowed to cook with small reduction in temperature or heating was observed and another thermometer was immersed with heating continuously at this stage the dropping point was measured and result obtained recorded.

3. RESULTS AND DISCUSSION

Oil Palm Bunch Ash Analysis

The preparation of grease requires three basic components namely base oil additives and thickener. The thickener when mixed with base oil will form semi-fluid to solid substance under room temperature. Generally, the thickeners used by grease manufacturing company such as AZ, Bexco, Allied etc include Lithium, calcium aluminum polyurea in their right proportion. We have established an experimental work to find out the possibility of obtaining grease from Oil palm bunch which is a common of agriculture waste in our local environment. In the present chapter we shall present the result we have gotten from the observation in our experimental work to produce grease, the analytical result and compared the result with standard characteristics of grease in the literature.

Oil Palm Bunch Ash Analysis Result

The preparation of grease requires three basic components, namely; base oil, additives and thickener. The thickener when mixed with base oil will form semi-fluid to solid substance. Principally used thickener include Lithium, aluminum and calcium soap. The development of a unique thickener from waste of agriculture is a key objective of the present work. Oil palm bunch where first crushed and sun dried for some hours to remove moisture content. Then burnt completely to ash, laboratory analysis of the ash was then be carried to determine the element present in the ash. It was observed that of the three species of the Oil palm bunch prepared, calcium, phosphorous and lithium presence is more pronounce in Tenera than in Pesifera and Dura as shown in Table 1.the presence of these elements in the ash, with addition of sodium silicate and other substance makes the ash a suitable thickener. The grease produced from this research which is made of soft and hard grease are presented in the appendix and the palm bunch used as the raw basic raw material.

Table 1: Analysis Results of Characteristics of Ash Content from Oil Palm Bunch

Elements	Concentrations
Chromium	0.088 mg/kg
Zinc	0.38 mg/kg
Calcium	146.15 mg/kg
Potassium	139.35 mg/kg
Sodium	0.63 mg/kg
Magnesium	1.68 mg/kg
Chlorine	2280 mg/kg
Phosphate	47.5 mg/kg

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From the result obtained as demonstrated in Table 1 revealed that the ash content extracted from oil palm bunch could be found useful in the production of grease (used as a basic raw material). The analysis result of the ash content revealed the presence of the following elements with their concentration, such as chromium (0.088mg/kg), zinc (0.38mg/kg), calcium (146.15mg/kg), potassium (139.35mg/kg), sodium (0.63mg/kg), magnesium (1.68mg/kg), chlorine (2280mg/kg) and phosphate 47.5mg/kg. The order of magnitude in terms of high concentration is chlorine> calcium> potassium> phosphate> magnesium> sodium> zinc>chromium.

Table 2: **Chemical Analysis Results of Oil Palm Bunch in Powder Form**

Sample	Ca mg/c	P (mg/c)	Li (mg/c)	Na(mg/c)	Al(mg/c)
Pesifera	116.91	102.30	10.15	102.80	82.24
Tenera	128.62	110.71	17.57	130.26	150.17
Dura	100.21	97.10	8.18	99.12	82.24

Table 2 demonstrates the analysis of some selected elements on the characteristic of the powder form of the oil palm bunch. The parameters or elements analyzed include the following calcium (Ca), phosphorus (p), Lithium (Li), Sodium (Na) and Aluminum (Al) for the different species of the oil palm bunch sampled. The following results are obtained, such as for pesiferasp, calcium (Ca) is 116.91mg/c, phosphorus (p) is 102.30mg/c, lithium (Li) is 10.15mg/c, sodium is 102.80mg/c and Aluminum (Al) is 82.24, while Tenera sp has the following values such as, for calcium (Ca) is 128.62mg/c, sodium (Na) is 130.26mg/c and Aluminum (Al) is 150.17mg/c and for Dura sp we have calcium (Ca) 100.2mg/c, phosphorus 92.10mg/c, lithium 8.18mg/c, sodium 99.12mg/c and Aluminum 82.24mg/c. The result obtained revealed the order of magnitude as follows for calcium (Ca) Tenera sp>pesifera sp > Dura sp. This concept is the same for phosphorus, lithium, sodium and Aluminum.

Dropping Point Test

The summary for the dropping point test values of the grease and the controls in degree

Table 3: Demonstration of the Dropping point analysis result

S/N	Grease sample	Dropping point
1	Bio-alkali base	125
2	Control 1 (Sodium base)	128
3	Control (2) AZ	130

Table 3 illustrates the dropping point analysis result of bioalkali base material, control base 1 using sodium based material and control base 2 using AZ. Dropping point gives an expression of the temperature causes changes in lubricating grease in terms of variation of state of semi-solid to liquid state. At temperature of bio-alkali grease in terms of dropping point was recorded to be 125°c wheras AZ is 130°c.

Table 4 and Table 5 illustrates the analysis of locally produced grease {soft} and hard. The result obtained revealed that the penetration values of soft grease is at 355 – 385, pH 6.30, Density 0.890g/cm^3, viscosity value of 2571, 852, whereas the hard grease is as demonstrated in Table 5.

Table 4: The Result Obtained from the Analysis of the Locally Produced Grease (Soft)

Parameter	Concentration Value
Penetration	355 – 385
Ph	6.3
Density g/cm^3	0.890
Viscosity@6rmp	14211mpa.s
Viscosity @12rmp	7122mpa.s
Viscosity @30rmp	2571mpa.s
Viscosity@60rmp	852mpa.s

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Table 5: The Results Obtained from the Analysis of Locally Produced Grease (Hard)

Parameter	Concentration Value
Penetration	255 – 290
pH	6.28
Density g/cm^3	0.939
Viscosity@6rmp	16241mpa.s
Viscosity @12rmp	8024mpa.s
Viscosity @30rmp	3502mpa.s
Viscosity@60rmp	1721mpa.s

Table 6: The Results Obtained from the Analysis of AZ Grease

Parameter	Concentration Value
Penetration	265 – 295
pH	6.5
Density g/cm^3	0.9126
Viscosity @30rmp	3722 mpa.s
Viscosity@60rmp	9324 mpa.s

Table 7: Comparison of the Grease Concentration with International Standard for both Locally Produced and Petroleum Based Material

Parameter	Concentration of locally produced grease (soft)	Concentration of locally produced grease (hard)	Concentration of AZ grease	International Standard Recommended
pH	6.30	6.28	6.5	4 – 7
Density	0.890	0.939	0.9126	0.9819
Viscosity@30rpm	2571	3502	3722	2880-3520
Viscosity@60rpm	852	1721	1882	1980-2420

From Table 6 and Table 7 demonstrates the characteristics of AZ grease and grease based on International Standard is given as pH value 4 – 7, Density 0.8919g/cm^{3}and viscosities of1350-1650, 6120-7480, 2880-3520, 1980-2420. The concentration of the hard grease produced locally has a penetration value of 255 – 290, pH value of 6.28, Density of 0.938g/cm^3 and viscosity value of 3502, 1721. The concentration of the locally produced greased was compared to the International Standard and the results obtained indicates the reliability of the product. The result obtained was also compared with the petroleum based grease as shown in Table 7. One of the significant observations was the closeness in density and pH value revealing that the grease produced using locally raw material is good because of the low rate of corrosion impact as well as low rate of moisture content.

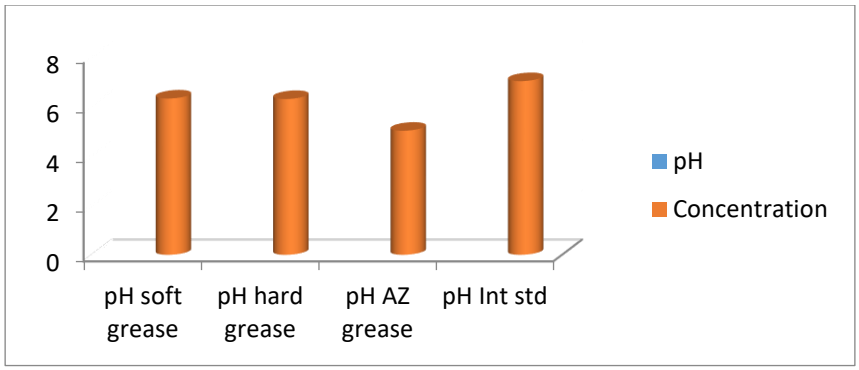


Figure 2: Graph of Comparison of the various pH of Locally Produced Grease, Petroleum Source and International Standard against Concentration Value

Figure 2 illustrates the relationship amog the pH values tested for locally made grease using palm bunch, petroleum based as well as the International standard. The result obtained indicate that the lubricating grease produced from the locally sourced material is less acidic as well posses less impact on the corrosion of metal when in use.

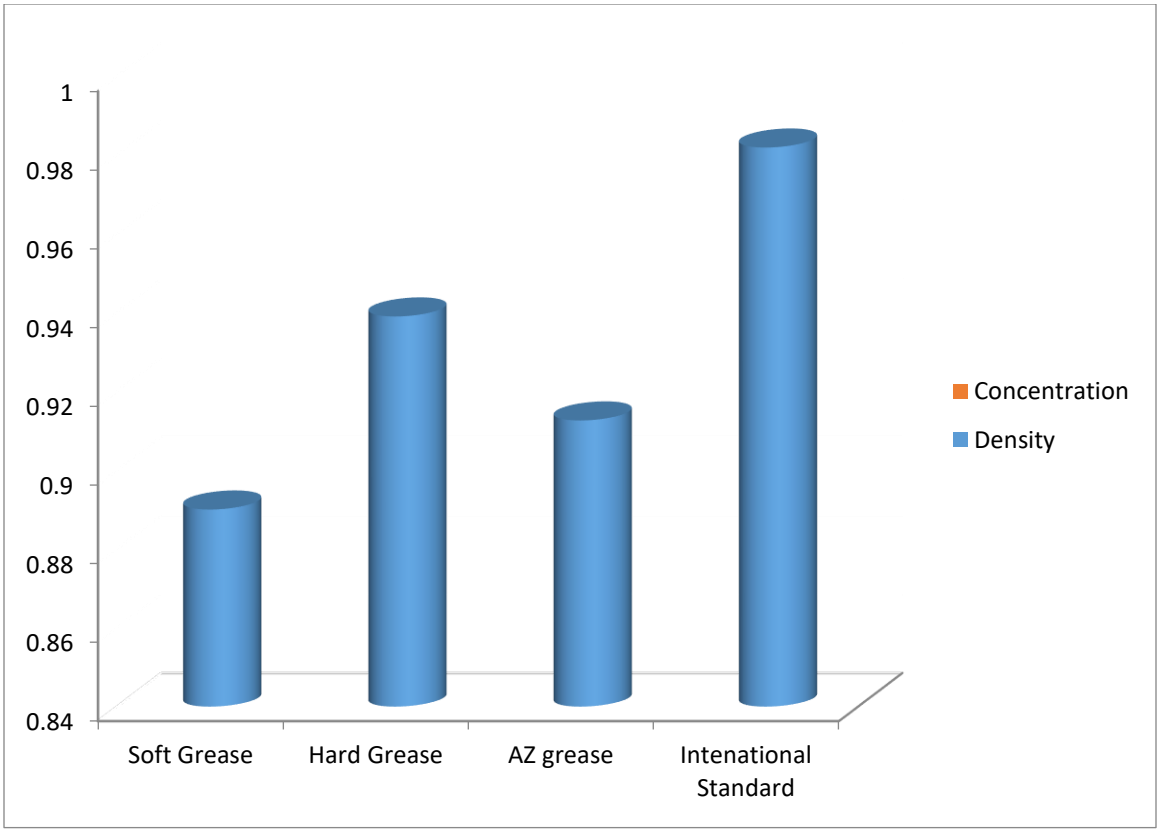
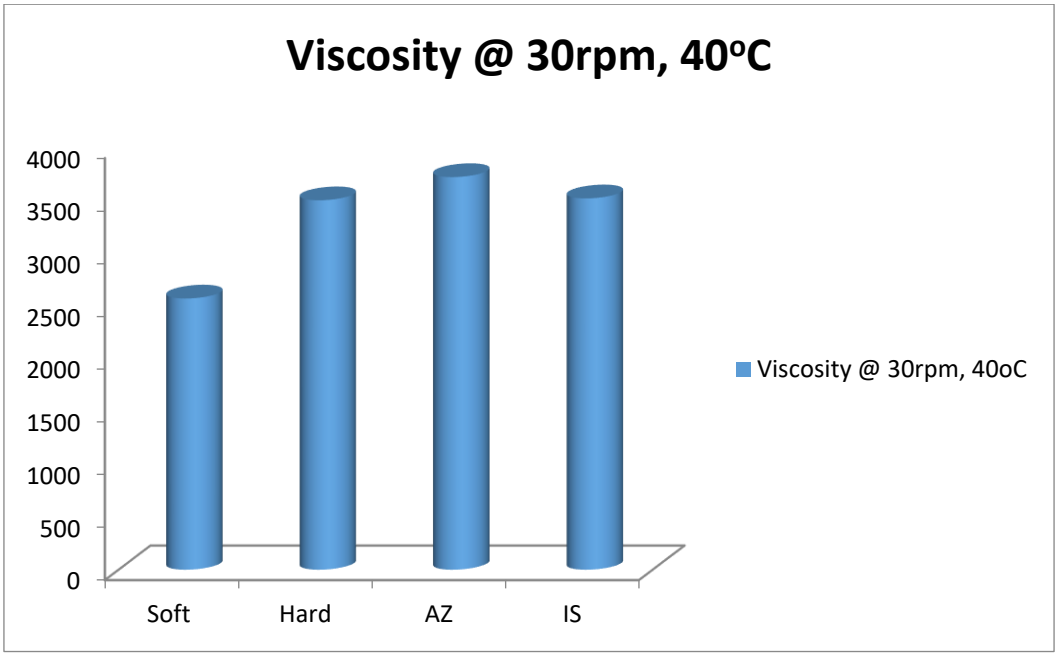


Figure 3: A graph of Comparison of the various Density of Locally Produced Grease, Petroleum Source and International Standard against Concentration Value.

Figure 3 illustrates the significance of the density in terms of weight. It is observed that the lubricating grease produced is of less wight but its characteristics indicate the durability as well as the quality when compared with International Standard.



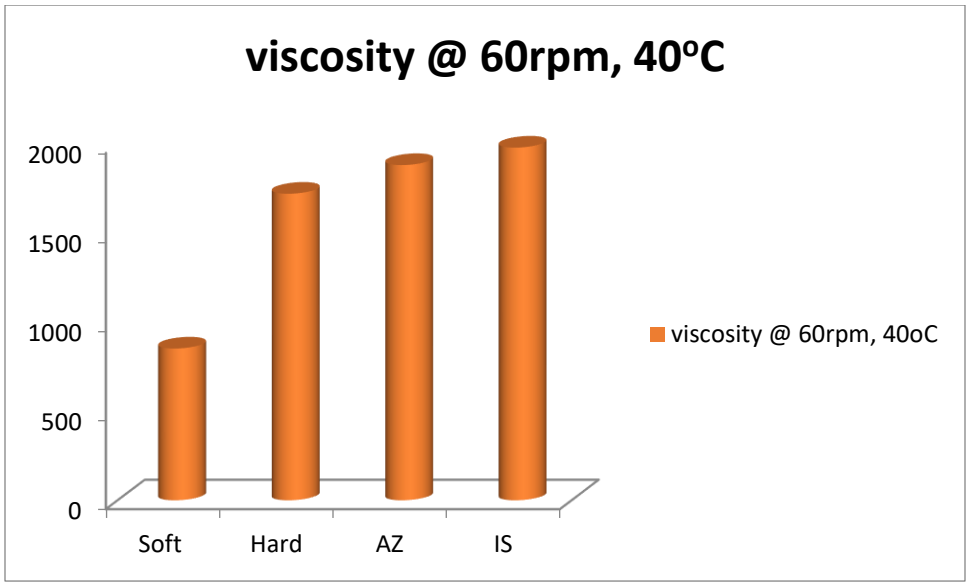


Figure 4: A graph of comparison of the viscosity of locally produced grease, petroleum source and International Standard against concentration value. Shows that the viscosity of the locally produced grease is close in value to the petroleum base and as well as the international standard. The viscosity of the produced grease (Hard) indicates low level of its viscosity flow when in used and the soft grease indicates high level of its viscous flow when in use.

Table 8: Comparison of Properties and Characteristics of Grease

Thickener	Dropping Point	Highest Temperature	Other Characteristics (Good, Very Good, Excellent)	Grease Structure
Natrium soap	160-200	120	Rust resistant good adhesive characteristics	Fibular
Calcium soap	95 – 100	80	Excellent water resistant very good pumpability	Smooth
Calcium complex soap	>260	150 with synthetic base oils up to 180	Good ability to bear high loads	Smooth
Lithium soap	185-205	130	Good water resistance Good mechanical stability	Smooth
Lithium complex soap	>240	150 (synthetic up to 180)	Good water resistance Very good mechanical stability Very good pumpability	Smooth, slightly extensible
Aluminium complex	>250	150 (synthetic up to 180)	Good water resistance Excellent shear stability Very good pumpability	Smooth gelatinous
Barium complex	>230	130	Natural ability to bear high loads Excellent corrosion protection Very good water resistance	Smooth
Polyurea	>230	150	Good oxidation stability Water	Opaque

Table 8 demonstrates the grease product and their characteristics when compared to the acceptable limit as properties are shown as described in this research work. The application of different thickener, dropping point and temperature revealed an excellence characteristics of the grease produced in this research work as illustrated in Table 8.

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Component Analysis Result for the Produced Grease

The base oil constitutes about 80 to 90% of grease, mineral oil was mixed with thicken (ash) with other constituent such as Oleic acid stearic acid and sodium silicate to produce the grease. The produced complex was then given a laboratory gas chromatography analysis treatment. The composition analysis result is presented in Table 2 for the three prepare samples, the chemical composition of grease was met, although higher composition is present in Tenera sample.

Table 9: Demonstration of the Composition Analysis Result of the Produced Grease.

Component Name	Tenera (pmm)	Pesifera (pmm)
Naphthalene	596.28970	401.53192
Acenaphthylene	675.98356	528.10171
Acenaphthene	881.52748	716.34813
Fluorene	1233.13415	1005.52418
Phenanthrene	498.75691	355.17102
Anthracene	856.05523	713.31096
Fluoranthene	1315.78642	1141.21542
Pyrene	1384.15931	1193.71019
Benz(a)anthracene	505.58920	338.00183
Chrysene	1049.34916	924.32190
Benz(b)fluoranthene	651.75182	523.21574
Benzo(k)fluoranthene	642.60213	429.34918
Benzol(a)pyrene	903.72245	712.24117
Indeno(1,2,3-CD) pyrene	528.56258	432.31803
Dibenzz(a,h) anthracene	376.31600	243.72478
Benzo(g,h,I) perylene	711.64812	551.52015

Table 9 illustrates the analysis result of the produced grease. The result obtained revealed the presence of the following compounds for both Tenera sp and Pesifera sp., such as; naphthale, acenaphthylene, acenaphthene, fluorine, phenanthrene, anthracene, fluoranthene, pyrene, benz(a) anthracene and others as presented in Table 9. The concentration of each compound in term of comparison of the Teera sp with Pesifera sp shows high value for Tenera sp than Pesifera sp as detailed results are presented in Table 9.

Consistency Test (Unworked and Worked Penetration)

The summary of the unworked and worked penetration values of the bio-alkali grease, sodium base grease and AZ grease is as shown in Table 10.

Grease consistency analysis

For the grease consistency test both the formulated grease and AZ NLGI grease were measured using the parameters of the un-worked and the worked penetration test and the only difference is poor shear stability

Table 10: Consistencies of NLGI of Test Samples and Control (0.1mm)

S/NO	Samples	Unworked	Worked	Balance
1	Bio-alkali grease	362	360	2
2	Sodium base	360	362	2
3	AZ grease	363	365	2

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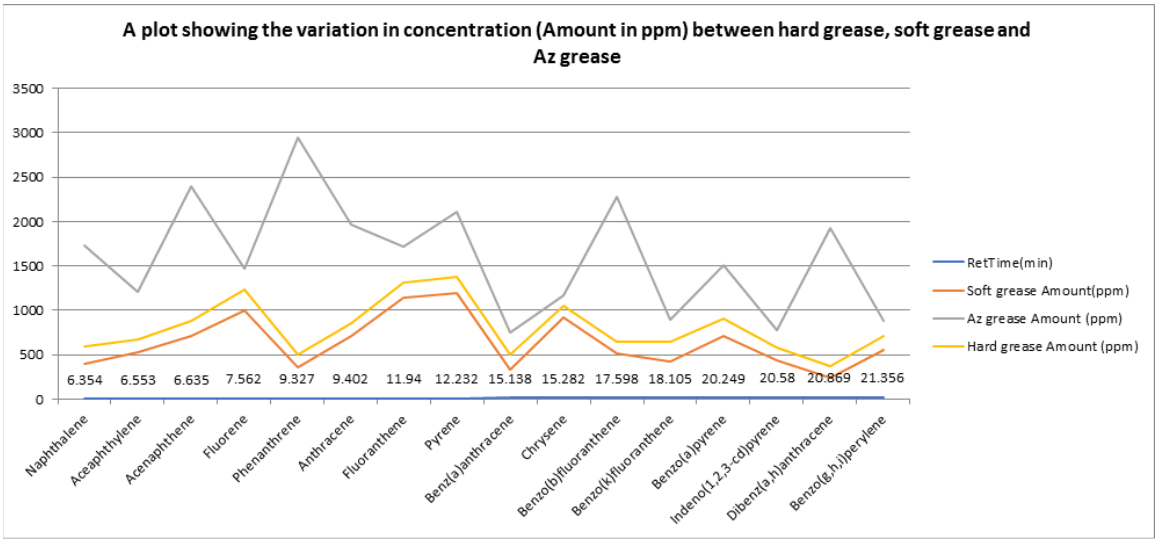

Figure 5: Comparison of Grease Concentration versus Available Compounds present in the Different Raw Materials used

Figure 5 illustrates the relationship between comparison of grease produced in terms of concentration and the available compounds present in its. Increased and decreased in product concentration was observed with varies in the compounds identified in each grease product produced from the different species sampled. The detail of the compounds identified as shown in Figure 5. The variation in the grease concentration can be attributed to variation in the composition of the end product identified in the Bio grease produced.

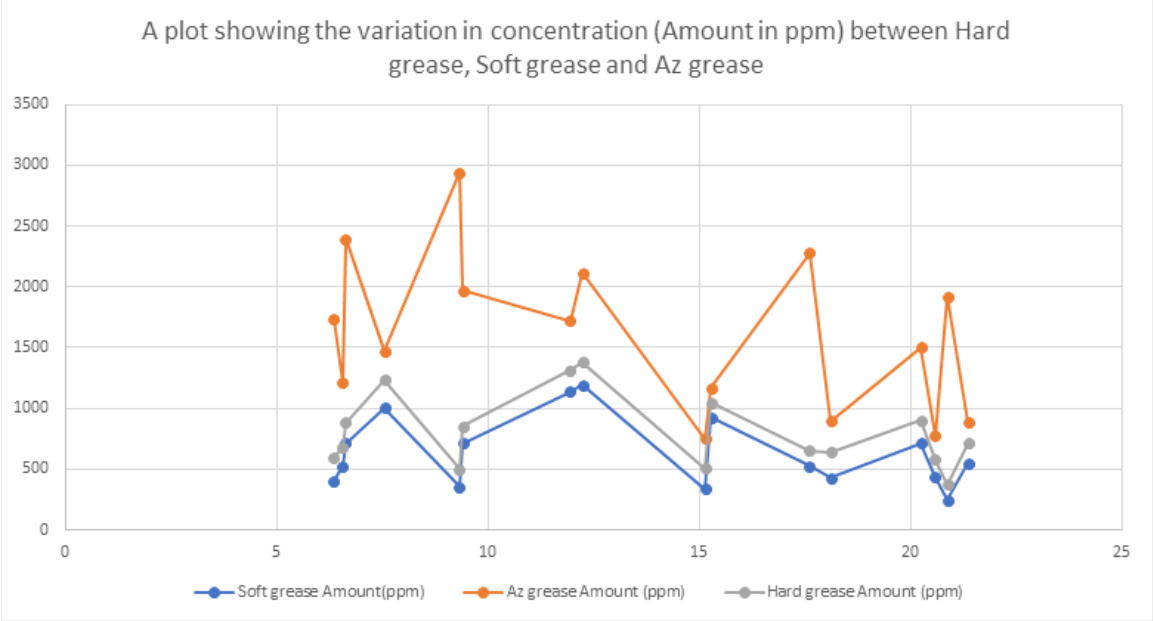

Figure 6: Comparison of Different Grease Concentration versus Retention Time

Figure 6 demonstrates the relationship between the grease concentration and retention time. Increased and decreased was observed in the grease concentration with increase in retention for the different species of the palm bunch used in this research work. The variation in the grease concentration can be attributed to variation in the retention time.

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Table 11: Concentration Value with Parameters

Parameter	Concentration value
Penetration	265 – 295
pH	6.5
Density g/cm3	0.9126
Viscosity @30rmp	3722 mpa.s
Viscosity@60rmp	9324mpa.s

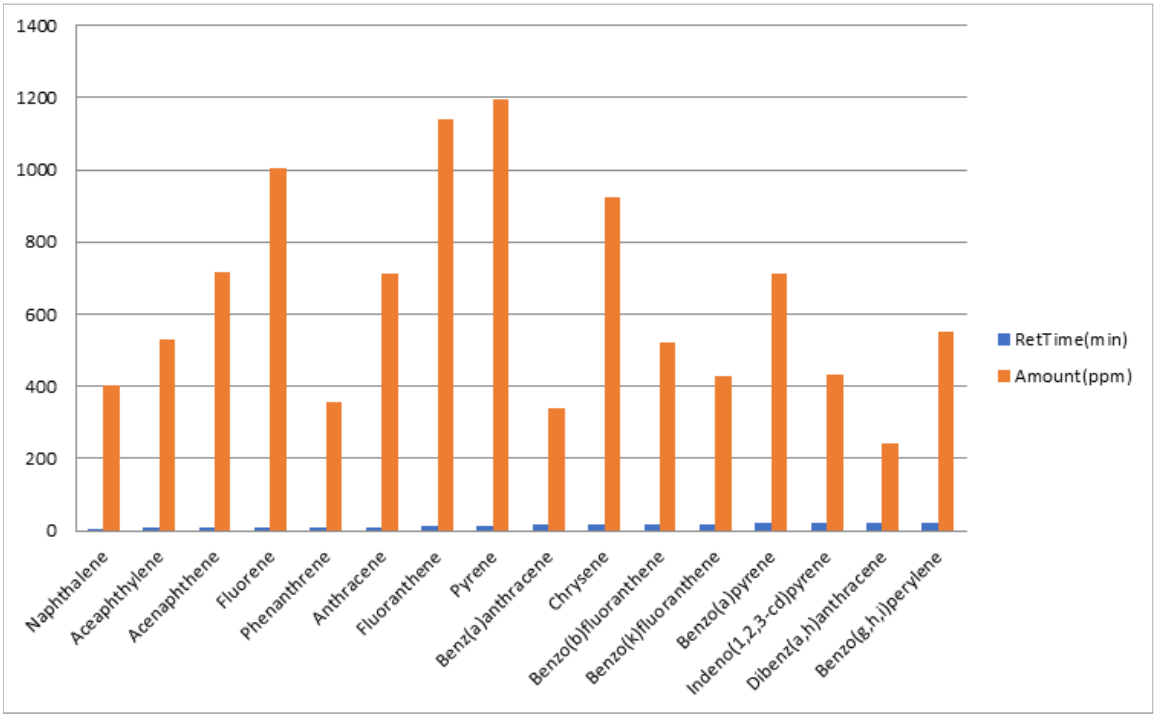

Figure 7: Retention Time versus Compound of Individual Component present in the locally produced Grease from Tenera sp.

Figure 7 showcases the relationship between the retention time and the AZ grease concentration and in terms of the each compound from the Tenera sp. The result obtained revealed the order of magnitude of pyrene> fluoranthene> fluorine> chrysene> anthracene> acenaphthene> Benz(o) pyrene> Benzo (g, h) perylene>acceaphthylene> Benzo (b) fluorenthene>Inderio (1, 2, 3, - cd) pyrene > Benzo (k) fluoranthene > naphthalene> phenanthrene> Benz(a) anthracene>Dibenz(a) anthracene.

4. CONCLUSION

Based on the findings from the study, the following conclusion can be drawn.

1. The formulation grease from empty palm bunch which is a common waste of agriculture when compared to NLGI standard of grease is similar.
2. The formulated grease contains all the chemical constituents of grease properties in the right varying proportion as contained in NLGI and that of the existing greases commonly used in Nigeria such as AZ grease, Bexco chemical ind. Ltd, ORS, Allied grease.
3. It was also found that these agricultural waste products (palm bunch ash) have the relevant elements needed for grease production.
4. it was also found that the chemical composition characteristics when used with proper additives will form a basic material (thickener) for grease production.
5. Dissolving the reagents give a finer and very smooth and better grease formulation.
6. A reduction in the soaking time give a better alkaline.
7. The appearance of the locally produced lubricating grease is of good standard but can be improved by the addition of colour.
8. The moisture content of the produced grease is 1.99g which indicates good standard of the product, this is an important factor because high content will influence the corrosion of mechanical device.

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9. In the process of production some polymer products were formed but no further analysis was conducted.
10. This research study has contributed immensely to the body of knowledge as it provides alternative raw materials as agro-by product that are commonly found within our locality as a replacement for petrochemical which has been a chief source of thickener for grease production.
11. Drawing from these points above, we may have reduced environmental waste and channel such to the production of valuable economic building material at least cost.

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Conflict of Interest

The author declares that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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