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EMERGING ISSUES IN STEM INTERNSHIP-TEACHING PRACTICE (TP) AND STUDENTS' INDUSTRIAL WORK EXPERIENCE (SIWES): CHALLENGES & PROSPECTS

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INTRODUCTION

One of the characteristics of a standard profession is the inclusion of internship in the curriculum. TP is a step in making teaching the most precious, noble, enviable and standard profession. It is a sheet anchor for teacher education programmes. According to TDP (2019) TP is perhaps the most important component of any pre-service programme. It is the student teacher's first direct experience of classroom teaching and it is one of the most important milestones in their professional development. It is a critical period when trainee teachers put all the learning from their time in College into practice and start to understand what it means to be a teacher.

HISTORICAL PERSPECTIVE

TP is as old as teacher education in Nigeria. With the introduction of Teacher Training College in Abeokuta in 1859 and Nassarawa School in 1909 the apprenticeship system of teacher training emphasized on-the-job training under the watchful eye of the Master Teacher. By 1929 two types of teacher training institutions evolved: The Elementary Training Center (ETC) for lower Primary School Teachers, a two year program course culminated in Grade III Teachers Certificate and Higher Elementary Training College (HETC), a two year program culminated in Grade II teachers certificate (Fafunwa, 2004).

A would be teacher had first of all to serve as a pupil-teacher for 2 years before proceeding to the ETC, then on the successful completion of Grade III course, he had to teach for at least 2 years before proceeding for Grade II course. The Ashby Commission's recommendation for teachers Grade 1 Colleges was modified to give rise to NCE for the preparation of teachers in the lower forms of Secondary Schools and in the Teacher Training College. Indeed history has its place in human development and **reforms**. The Federal Advanced Teachers Colleges were later established in 1962 (Ibadan moved to Ondo, 1962/1964; Owerri,1963; Zaria, 1962; and Kano, 1964.) To achieve NCE then, a candidate must pass at a final examination in two science subjects and two arts, education and **practical teaching**. Federal College of Education (Technical) Bichi (the College where I currently lecture) was established by Decree No. 4 FGN Gazette dated 21/3/1986. The College became fully operational and lectures started on 4/1/1989. The first and second TP of the same set of students took place in April 1990 (at NCE II level) and October 1990 (at NCE III level) respectively. It was a two tier TP system under ABU affiliation. It is difficult to

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believe that despite the background history of education, teaching as a profession is still far behind other professions in Nigeria.

On SIWES in the teacher education sector, it is a fact that no society can achieve meaningful progress without encouraging its youths to acquire necessary practical skills. Such skills would enable them to face the challenges of harnessing available resources to meet the needs of their societies and also improve on the means of production. According to Adeluyi (2006) this was what necessitated the concept of SIWES in 1973. For the students, it was envisaged that SIWES would prepare them to fit into industrial work environment after their career and for the lecturers it was also designed to offer them opportunity to evaluate the relevance of training to the needs of industry. The main aims and objectives are not far-fetched and are comparable to the aims of internship as stated in SIWES booklets.

SIWES commenced in 1974 and in 1979, the Federal Ministry of Education made it compulsory for relevant programmes in Polytechnics and Colleges of Education. In Federal College of Education (Technical) Bichi, the first enrolment of students for SIWES was in 1989 (108 students, in 43 establishments, across 14 states).

Ladies and gentlemen, I was privileged to serve on TP, SIWES committee (combined) and have keenly followed COEASU's positions on TP and Federal Government proposed incentives for teachers. Really, there are emerging issues on TP and SIWES which if well discussed constructively, would provide a road map for improvement. I therefore hope that this conference will do great justice to emerging issues on STEM internship. The subthemes are loaded and have summarized issues of discourse.

I wish to eulogize the Federal Ministry of Education, TETFund, Universal Basic Education Commission, SUBEB, National Commission for Colleges of Education, ITF and supporting donor intervening agencies for great work done on Teaching Practice and SIWES. So far, there are well articulated guidelines and working documents on TP and SIWES. The Agencies have appropriately made the Colleges of Education and the curricula the engine room for TP. Colleges of Education lecturers in particular are TP brain boxes.

The present nature of pre service teacher training especially at the College level is comparatively the best amongst the Teacher Training Institutes and Faculties of Education in Nigeria because of the comprehensiveness of its TP. It is worth noting that TP student teachers need to be prequalified through micro teaching process and courses. Also, there are TP briefings and administrative processes for both staff and students during and after TP. Quite a lot of professional activities were designed and applied including TDP models.

From the theme and the subthemes, I wish to raise six issues and emphasize two as my contribution to the discourse: (1) Definition of TP and related terms

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(2) Period of internship. Two tier or one tier system, 1 year, 3months, 6months or 18 months TP duration
(3) Harmonization of TP and SIWES incentives for Colleges as in the implementation guidelines for NTEP (2009) Pp 7paragraph 4.2(4)
(4) Reflection of SIWES in the implementation framework of the NCCE Minimum Standard.
(5) Format of TP tools and kits (toolkit) and their recency Vis a Vis TDP input
(6) The place of self assessment in TP and SIWES especially on the part of the trainee teachers and reflective teaching.

PROBLEM OF DEFINITION

What do students do on TP ? Ojegun (2009) described **Teaching Practice** as what a qualified, professional teacher does which is comparable to **Legal practice**, **Medical practice** etc; **Practice teaching** as learning how to teach under the guidance and supervision of a professional teacher; and **practical teaching** as physical demonstration of actual teaching that is rated by master teacher and external examiner. According to Mohanty (2009) Student teaching, practice teaching, In school experience, teaching rounds, internship are similar in definition.

How are students' TP scores or grades captured in the NCE Certificates, Statement of results, Transcripts and Reports?. Any discrepancies ?(YES). In the college mentioned earlier, Class Teaching is reflected in students' statement of results while TP is used in the NCE Certificate designed by NCCE. Hoping that this conference will address such if it is worthy of emphasis.

SELF EVALUATION AND REFLECTIVE TEACHING

How much data does a teacher have about his progress in teaching ? A pilot has the numbers of hours he has flown. He cannot do without his logbook. The Minimum Standards (2020) provides for lecturer's assessment by his college students but no provision for self evaluation. Asiedu-Krofi (1985) observed that to teach oneself on the job is based on the principle that learning is a life-long experience. So to confine teacher education to Training Colleges and a host of skills without teaching oneself through self-evaluation will defeat the purpose of education.

The present nature of the TP process will prepare trainee teachers for the job but after College, one can decide to be the kind of teacher one wants to be. Devoid of personal development and self-evaluation spirit, the present TP efforts will yield dictatorial and prescriptive results which were not purported. In the process, **more** professional freedom on assessment needs to be emphasized for pre service teachers' future independent development. A more problem solving model or innovation is needed.

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The Colleges should provide means of self evaluation to the students, show them criteria for success and present models and principles that will guide trainee teachers in search of tentative procedures.

Also, reflective teaching, a fitting approach to teaching which is enhanced by self evaluation is suggested. The main aim of reflective teaching is to support trainee teachers, mentors, and coordinating school no matter how experienced, to reflect upon teaching in a more systematic way (Pollard et al., 2006). Reflective teaching model, will improve upon the limiting effect of traditions in TP, habit, authority, institutional definition and expectation. Reflective teaching involves willingness to engage in constant self-appraisal and development. It involves flexibility, rigorous analysis and social awareness. The approach should be explored for further improvement. In conclusion COEASU (2014) stated that TP is a major exercise in teacher preparation just as housemanship is to Medical Doctors in training and moot court practice is to law students. The Union therefore demands that government should take full responsibility in financing TP exercise. It is now the right time to call COEASU National Executive to follow up on Government promises to fully finance teaching practice through TETFund and pay student teachers, supervisors and other participants. The whole world is aware of the promises made. It is when the teachers' incentives promised are fulfilled that pre service and in service teachers will sincerely and proudly thank the Federal Government of Nigeria for a good job well actualized. I thank science teacher educators for upholding the Code of Conduct. I also appreciate everyone present for your interest in teacher education. Thanks to all offline and online listeners/participant. God bless you.

References

Adeluyi, O. F. (2006). Emerging Challenges in SIWES Operations. In Industrial Training Fund. *10th Biennial SIWES National Conference*. Ruche Press.

Asiedu-Akrofi, K. (1985). *The professional and personal development of the teacher.* Evans Brothers.

COEASU (2014). *Towards the survival of nigeria teacher education system.* Maigida PP

Fafunwa, A. B. (2004). *History of education in nigeria.* NPS.

Federal College of Education (Technical) Bichi Annual Report. 1989 – 1990.

Mohanty, S. B. (2009). *Student teaching*. PH Publishing Corporation.

WATARI: Journal of Science, Technology and Mathematics Education Volume 5 Number 1 (2021).
ISSN: 2335-3345. https://watarijournal.com. Email: bichisose@yahoo.com TETFund sponsored

National Commission for Colleges of Education (2020).Curriculum implementation framework for Nigeria certificate in education.

Ojegun, S. U. (2009). *Success in teaching practice*. Somo Publishing Centre.

Pollard, A., Collins, T., Maddock, M., Simco, N., Swerffield, S., Warin, J. & Warwick, P. (2006). *Reflective teaching.* Continuum.

Taiwo, C. O. (1980). *The Nigerian education system. Past, present and future.* Thomas Nelson.

Teacher Development Programme. (2019). *Handbook for teaching practice supervisors.* Mott MacDonald Limited.

BIODIESEL FROM BLACK PLUM *(vitex doniana)* SEEDS VIA-BASE CATALYZEDTRANESTRIFICATION REACTION

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ABSTRACT

Due to the increase in the global energy demands, there is an increased in search for alternative sources of fuel. Due to its similarities with petroleum-based diesel, biodiesel arose as a potential replacement for diesel. In this study, biodiesel was produced from the seed oil of black plum (Vitex Doniana) using a two-step catalyzed transesterification reaction. The Physico-chemical analyses carried out on the produced biodiesel gave strong indication that it can serve as an alternative feedstock, having recorded a comparable flash point of 102 °C to American Society of Testing Materials and European Committee for Standardization standards. The percentage yield of oil was (50.1%), acid value of the oil was (4.09), specific gravity was (0.9711 g/cm^3) kinematic viscosity was found to be (11.5mm/s) and the p^H was also found to be (8.52). These values indicates that black plum oil will be very useful industrially for the production of biodiesel, though kinematic viscosity measurements showed biodiesel products of relatively high viscosity which has the tendency to leave deposits on combustion. .

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1.0 INTRODUCTION

In this modern world, biodiesel is becoming an increasingly important alternative source of energy. The use of biodiesel will reduce the use of fossil fuels thereby minimizing the emission of green house gasses which causes environmental hazard to both living and non living things. Therefore, biodiesel as a substitute for the depleting fossil fuels will also lead to environmental friendly, sustainable and viable source of energy, which will reduce the dependence on the depleting fossil fuels. The worldwide worry about the protection of environment and the conservation of nonrenewable natural resources, has given rise to alternative development of sources of energy as substitute for additional fossil fuels (*Supple et al, 2012*). The major part of all energy consumed worldwide comes from fossil sources (petroleum, coal and natural gas). Thus, looking for alternative sources of new and renewable energy such as biomass, hydro, wind, solar, geothermal, hydrogen and nuclear are of vital importance (Ezekwe & Ajiwe, 2014). Alternatively, new and renewable fuel have the potential to solve many of the current social problem and concerns, from air pollution and global warming to other environmental improvements and sustainability issues (Ezekwe & Ajiwe, 2014). Vegetable oils have become more attractive recently because of its environment benefit and the fact that it is made from renewable resource (Ezekwe & Ajiwe, 2014).

As a substitute for the fast depleting fossil fuel (*Sambo, 2010*), biodiesel which is an alternative for or additive to diesel fuel that is derived from the oils and fats of plants, like sunflower, Conola or Jatropha had come to stay (Meher, L. C. *et al*., 2009) . It should be able to reduce and maintain the price of automobile fuel and drastically minimized the environmental unfriendliness of the hydrocarbons based fuels. The under exploited and unexploited edible and non edible seeds of many plants are good sources of Biodiesel (Meher, L. C. *et al*., 2009). Our country is endowed with many of such plants. Research is being carried out now to convert also vegetable oils into biodiesel through biotechnological process (Sabrina *et al*., 2015). With a concentrated and coordinated effort, wide use of biodiesel in our country is going to be a reality in the days to come.

1.1 STATEMENT OF THE RESEARCH PROBLEM\

A national energy master plan and renewable energy master plan drafted by energy commission of Nigeria encouraged biodiesel production which covers all aspects of plantation, procurement of seed, extraction of oil, transestrification, blending and trade, as well as research and development. As at 2008, diesel forms about 11% of the energy consumed in the form of hydrocarbon fuels, ad its demand was estimated at 1, 517, 496. 64 million litres (*NNPC ARB, 2008*). Therefore, blending becomes

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necessary to minimize environmental pollution and also saves the country's exchequer. Nigeria has vast stretches of degraded land, mostly in areas with adverse agro – climatic conditions, where species of Jatropha, sunflower, Soya beans, wild grapes, and so on can be grown easily.

Even 30 million hecters planted for biodiesel production can completely replace the current use of fossil fuels. The production of biodiesel will also boost the rural economy and more enthusiasm in more than one billion lives in the area and generate thousands of jobs for both rural and urban are as (Morrison r.t and Boyd, r.n., 2008). The use of vegetable oils as an alternative renewable five competing with petroleum products was proposed in the beginning of 1980s.

1.2 THE BLOCK PLUM (*vitex doniana*) SEED

The seed used for the production of biodiesel in this study was obtained from its tree, called black plum (English name). While botanical name of this tree is *VITEX DONIANA*, the family name is Verbenaceae. The local name are plana (Amargna), silanni (Ari) and the Hausa people call it "Dinya".

Vitex doniana sweet (black plum) is a widespread deciduous forest tree largely found in coastal woodlands and savannah but also in water areas at lower altitudes and on Zanzibar and pemba islands. It is found in deciduous woodlands (especially Brachystegia), secondary forest, and dry forests. It is not found in montane rainforest and dry forests. It is not found in montane rainforest and the Dodoma thicket belt (Sabrina *et al*., 2015). The soil requirement it is found on fields, fallow and on alluvia soils. The means of propagation include wildlings, seed, coppiece and root suckers.

The seed treatments fruit id oblong about 3cm long, turning black when mature (Meher, L. C. *et al*., 2009)

1.3 Description of biodiesel

Biodiesel is a light to dark yellow liquid, it is practically immiscible with water , it had high boiling point and low vapor pressure. Typical methyl ester (biodiesel) has a flash point of 150^0C (300^0F), making rather none – flammable. Biodiesel has a density of about 0.88kg1m^3 and when not contaminated with starting material can be regarded as non – toxic (*Ma et al., 1998*) (Adelodun *et al*., 2016).

1.3.1 Properties Of Biodiesel

Biodiesel and petroleum diesel vastly differ in their chemical composition. These differences give biodiesel different physical and chemical properties. The composition and properties of biodiesel depend on the feed stock used on the manufacturing process (Morrison r.t and Boyd, r.n., 2008).

1.3.2 Product quality of biodiesel

Biodiesel is a better fuel than petro diesel and has been known to break down deposit of residue in the fuel lines of vehicle that has previously been run on petrol fuel filter

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may clog with particular test if a guide transition of pure biodiesel is made, as biodiesel cleans the engine in the process. It is therefore, recommended to change the filter within (600 – 800 miles after first switching to a biodiesel blend (Kessler, M.R. 1985). Prior to use as a commercial fuel the produced biodiesel must be analyzed using sophisticated equipment to ensure it meet any required specifications. Biodiesel's commercial fuel quality is measured by the ASTM standard (i.e American standard for testing materials). The standard ensures that biodiesel is pure and the following important factors in the fuel production process are satisfied.

a) Reaction completion (b) Removal of alcohol
c) Removal of glycerine (d) Absence of free fatty acids
e) Low sulphur content (Kessler, M.R. 1985).

As such, biodiesel can be defined as the mono alkyl esters of long chain fatty acids derived from vegetable oil or animal fats, for use in compression ignition engine (*Pahl, 2005*.)

3.0 MATERIALS AND METHODS

All the chemicals used in this experiment are of high analytical grade.

3.1 Chemicals

N- hexane, sodium hydroxide (NaOH), Methanol, Sulphuric acid (H_2S0_4), Sodium sulphate (crystalline), Potassium hydroxide (KOH), Silica gel, Grease, deionized water.

3.2 Apparatus

Set of soxhlet apparatus**,** Condenser, Receiver, Adapter, Thermometer, Round bottom flask, Beakers, Measuring cylinder, Conical flasks, Filter paper, Funnel, Reflux condenser, Thimble, Standard agitator or mixer, Water both, Heating mantle, Retord stand, Centrifuge, Separating funnel.

3.3 COLLECTION OF VITEX DONIANA SEED

The sample of Black plum (Vitex Doniana) fruit were collected from its tree in Bayero University compound and some parts was purchase from Kurmi market in Kano City. The fruits were dried and the dried edible portion was washed and allow it to dry again out of sunlight. The seed was obtained from fruit using two pair of stones to crush the dried fruits and remove the seed (the sample) from its shell. This takes about two to three weeks to obtain the required quantity of the sample. After crushing all the dried fruits, 45g of the sample was now obtained. The sample (seed) obtained was granted using morta and pestle and the grounded sample was weight exactly the quantity required in a thimble, then inserted into the soxhlet extractor which was greases and fitted into a round bottom flask containing nhexane.

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Fig 1: Black plum fruit black plum seeds

3.4 EXTRACTION OF OIL FROM THE BLACK PLUM SEEDS:

Twenty gram (20g) of the sample was weight and puts into a thimble and covered with a filter paper. The thimble was inserted into the soxhlet extractor which was greased and fitted into a round bottom flask containing 250cm^3 of n-hexane. The round bottom flask was placed into a heating mantle and the set – up was clamped to a retort stand. A reflex condenser was then fitted to the top of the soxhlet extraction column and the heating mantle was switched on, the tap connected to the reflux condenser was also turned on when the n-hexane began to boil the vapor passes through the condenser which condenses it to liquid and then drop into the sample until the thimble was filled. As the liquid drops into the sample, it extracts the oil and when the thimble was filled up, the oil extracted together with the n-hexane was emptied into the round bottom flask. This was repeated several times until the oil was extracted completely and this took about 7 hours. There after the whole setup was removed leaving only the round bottom flask on the heating mantle. The content heated at 40^{o}C for 10 minutes with the round bottom flask placed on a water both and the heating continued until the excess solvent was expelled and only the oil was left. The oil was then placed in a vacuum oven at 40^{o}C for about 30 minutes to further dry it. The volume and the mass of oil extracted were determined. In order to ensure total extraction of the oil, the same procedure was repeated using chloroform and ethyl acetate with the same sample in each case the mass of the oil extracted were determined and recorded (Supple B. *et al*., 2002). Percentage yield was calculated using:

$$\text{Black plum oil yield (\%)} = \frac{\text{weight of oil}}{\text{Weight of powder}}$$

3.5 CONVERSION OF OIL TO THE BIODIESEL (Transestrification) A given mass (0.40g) of the NaOH was added to 40cm^3 of methanol and stirred until it was completely dissolved. The mass of the oil was placed in a flask and the metabolic NaOH solutions was added to it. The catalyst used here is typically NaoH (i-e caustic soda). It is dissolved in the alcohol using standard agitator or mixer. The

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alcohol/catalyst mixture is then put into a closed vessel and the oil or fat is added. The system from here on is totally closed to the atmosphere to prevent the loss of alcohol for a recommended time of 1 to 8 hours. The reaction mixture was kept just above the boiling point of alcohol (around 160oF or 71^{o}c) to speed up the reaction. The mixture was stirred for 20 minutes at 25c and then pounded into a separating funnel. After about an hour no separation occurred and the mixture was left to stand in the separating funnel for 24hrs, but there was still no separation then, a solution of 1% sulphuric acid was then added and the mixture was stirred and poured into a separating funnel, after 2 hours it forms three layers of water mixture, soap solution and biodiesel. The water was at the bottom, the middle layer was soap and the top layer is the biodiesel. The soap and water were collected leaving the biodiesel. Once the reaction is complete two major products exist. Glycerin and biodiesel. The glycerin phase is denser than the biodiesel phase and the two were gravity separated with glycerin simply drawn off the bottom of the setting vessel. The equation of the reaction is as shown below:

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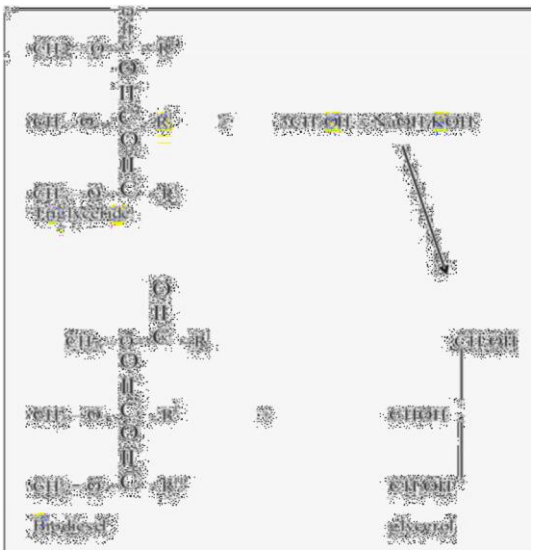

Fig 2: Biodiesel production by transetrifcation reaction.

Once the glycerin and biodiesel phases have been separated, the excess alcohol in each phase was removed with a flash evaporation process. The glycerin by product contains unused catalyst and soaps that are neutralized with an acid and sent to storage of a crude glycerin. Once separated the biodiesel was purified by washing gently with worm water to remove residual catalyst or soaps, dried and sent to storage. This is normally the end product process, resulting in a clear amber yellow liquid with a viscosity similar to petrol – diesel (Ezekwe & Ajiwe, 2014). Percentage yield was calculated using the relation:

$$\text{Biodiesel yield \% (v/v)} = \frac{\text{Volume of biodiesel produced}}{\text{Volume of esterified oil}}$$

3.6 PHYSICOCHEMICAL ANALYSIS

The physic chemical analysis was carried out in order to assess the quality of the oil extracted. The reasons is to ascertain the acceptability, stability and other characteristics of the oil extracted in terms of production of high grade biodiesel. The physicochemical parameters analysed include: Percentage yield, acid value, Specific Gravity and p^H as shown in table 1.

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4.0 RESULTS AND DISCUSSIONS

1	Percentage yield (%)	50	98.1
2	Acid value (mg NaOH/g	4.09	4.09
3	Density (g/cm3)	0.971	0.72
4	P^H value	8.52	
5	Colour	Pale yellow	Pale yellow
6	kinematic Viscosity (mm/s) at	27.2	11.5 25^{o}C

Table 2: Comparison of some of the physicochemical parameters With ASTM D6751-07b

S/N	Parameters	Black plum oil	biodiesel	Astm D6751 07b
1	Percentage yield	98.1	-	
2	Acid value mgNaOH/g	4.09	3.71	
3	density(g/cm^3)	0.72	0.87-090	
4	Colour	Pale yellow	Pale yellow	
5	K. viscosity (mm/s)	11.5	8.5	
6	Flash Point (^{o}C)	102	>98	

4.2 DISCUSSION

The physicochemical analysis for both the oil and the biodiesel shows that, the parentage yield was found to be 50% and 98.1% for oil and biodiesel respectively. The biodiesel produced from the oil of black plum (*Vitex doniana*) seed was substantially higher than biodiesel yield from the oils extract from pumpkin and watermelon which gave yield of 58.80% and 40.20% respectively (*Ali, 2008*), as well as biodiesel extracted from lannea micro carpa seeds which gave a yield of 79.80%. Therefore the biodiesel obtained from black plum seed was economically viable in terms of biodiesel yield.

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As shown in table 2, the range of the density obtained lies in the range of American seed can be used directly in diesel engine without any modification. However, any oil with high specific gravity will create more operational problem to the engine. The acid value of the oil shown in table 1 shows that the oil is suitable for industrial use and for production of biodiesel. Acid value is the measure of the extend to which the glyceride in the oil have been decomposed by the lipase (Nolte m. et al., 2007). The viscosity of the oil extracted from the black plum seed was found to be 11.5mm^2/s viscosity is a resistance of a liquid to flow or its thickness; it describes a fluids internal resistance to flow and may be thought of as a measure of fluid friction (Sabrina *et al*., 2015). The higher the viscosity the less readily the liquid flows and it causes injectors not to work properly.

The viscosity of the biodiesel produced from block plum seed was found to be 11.5mm^2/s the shows that the viscosity of the biodiesel obtained from black plums seeds was higher than the maximum value of 6.0mm^2 recommended in USA standard for biodiesel. Hence it will have lesser adverse effect on the injectors of engines (Supple B. *et al*., 2002).

The pH of the biodiesel was measured using Jenweh Ph meter model 3320. The pH value indicates that base catalyzed transestrification of the oil was used as the method for biodiesel production. If hydrogen ion concentration is greater than the hydroxide concentration, then the pH will be less than 7 which would indicates acid catalyzed transestrification.

5.1 CONCLUSION

Black plum seeds contain audible oil suitable for biodiesel production with high economic yield. Transestrification process is use in the production of biodiesel using alkoxide as the catalyst. Methanol is used to produce the biodiesel in which 12.5% methanol and 0.7% NaOH can be use to produce biodiesel with maximum yield of 98%. The optimum reaction time for maximum biodiesel production with methanol and NaOH was observed at 6 hours.

The results showed successful transesterification of oil from Vitex doniana seeds. The seeds which are considered waste have 50.5% oil and can serve as alternative feedstock for biodiesel since the biodiesel conversion percentage is in excess of 98%.

Society for Testing Materials (ASTM) which shows that the biodiesel from black plum

4.1 RESULTS

Table 1: Physicochemical parameters of black plum oil and its Biodiesel

S/N	PARAMETER	VALUE	
		OIL	BIODIESEL

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5.2 RECOMMENDATION

From the findings and analysis in this research, the following recommendation have been made:

i. Nigeria is blessed with a lot of fruits and vegetable which are the sources of biodiesel, industries in the country must realized and to profitably learn from countries with an already developed biodiesel industries. ii. The government and other private

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sectors should use this opportunity to eradicate poverty by encouraging the rural dwellers where there are a lot of black plum trees.

iii. All the stakeholders should be involved in every step for the development of a successful biodiesel industry.

iv. Both students and lectures should mobilize the rural communities in realizing the important of those fruits like block plum found at the door step of common man in the production of renewable energy in order to make our environment clean and healthy.

REFERENCES

Adelodun S.T.; Adewole, O.S.; Bejide, R.A.; Adeyemi, D.O.; Arayombo, B.E; Saka, O.S.; Olayode, A.A. (2016) Protective effects of Vitex doniana (black plum) against ischemic testes torsion injury: Histological and morphometric features. *Journal Int. Soc. Pathophysiol*, 23, 157-168.

Ali U.U. (2008), "Comparative production biodiesel from calabash, pumpkin and watermelon seeds" *Journal of chemical engineering.* Pp29-32.

Ezekwe, C.C.; Ajiwe, V (2014). "The variations of physicochemical properties of biodiesel blends with the blend ratios. *International Journal. Science, Innovation and Discover*y, (4) 11-14.

Kessler, M.R., (1985). Understanding solvent extraction of vegetable oil. VITA, *Journal of American oil chemical society*. New York university 75 (9): 10771078

Meher, L. C., Sagar, D., Naik S.N., (2009) Technical aspects of biodiesel production by transesterification: *Renewable and sustainable Energy Reviews*, 10:248268.

Morrison R.T and Boyd, R.N., (2008) *organic chemistry* PHI learning private, pg 134-251

Nolte, M., Young H, .Kal and John T. Kirch (2007) Commercial biodiesel production in south Africa. A preliminary economic feasibility strong. An unpublished M.Sc thesis, University of Stellenbosch, Stellenbosh 19-23.

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Pahl, G, (2005). Biodiesel growing a new energy economy white river junction, *International Journal of Material Science*, Vol.5, 231-345

Sabrina, N.R.; Vany, P.F.; Leandro, S.O.; Adriana, S.F.(2015) ' FTIR analysis for quantification of fatty acid methyl esters in biodiesel produced by microwave assisted transesterification. *International Journal of Environmental Science*. Vol.6, 964-969.

Supple, B., Howard – hildige, R., Gonzale Z-Gomez, E., Leahy J.J., (2012). The base catalyzed biofuel production, VITA, *Journal of American oil chemical society* Vol.8, 89-231.

United Nations Environmental Programs (UNEP 2012) 'Global Assessments and Guidelines for sustainable Liquid Biofuel Production In Developing Countries, Final Report.VT Chelsea green publication, 234-567.