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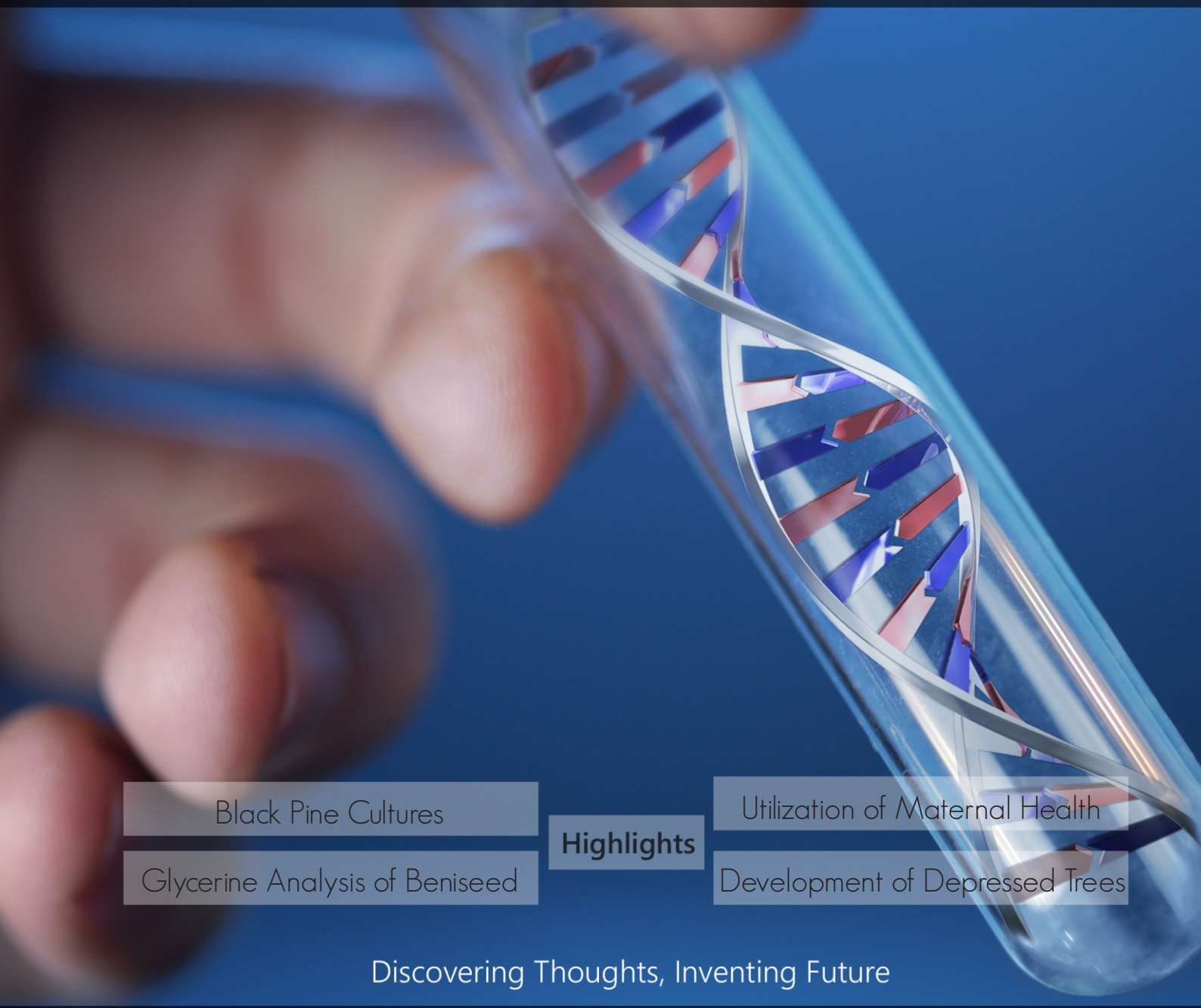

Black Pine Cultures

Glycerine Analysis of Beniseed

Highlights

Utilization of Maternal Health

Development of Depressed Trees

Discovering Thoughts, Inventing Future

VOLUME 15 ISSUE 4 VERSION 1.0

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Development of Depressed Trees of Black Pine Cultures in the Region of Šumadija. (Serbia)

By Severin Šikanja
Singidunum University Belgrade, Serbia

Abstract- We analyzed all abiotic and phytocoenological and ecological factors, with special emphasis on edaphic and climatic conditions and the phytosociological factors, namely the ground flors as indicator of development and growth of black pine trees. The research was done in Šumadija in the area of Forest management of Kragujevac, covered mostly with the black pine. Thus, 5 permanent sample plots in the cultures of black pine raised:

The study analyzed the culture of black pine of 3o, 4o, 55-60. years of age. After the comparison, dminant and oppressed trees in the cultures were done, with valuable new data. Depressed tree can become dominant., which is abig news of Forest Science, yet possible only with proper care measures.

Keywords: *black pine, culture, šumadija, soil.*

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DEVELOPMENTOFDEPRESSEDTREESOFBLACKPINECULTURESINTHEREGIONOFSUMADIJASERBIA

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Severin Šikanja

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Keywords: black pine, culture, šumadija, soil.

I. Introduction

Black pine cultures are spread in our country in various natural conditions, depending not only on geographical, orographic and climate factors, but also on geological base, terrain type and herbal communities (Jovanović S., 1988). Black pine cultures can be found on the soils like limestone, dolomite, serpentine, silica stone, which have high influence on their structure considering certain floristic elements, habitat and the stand solvency. (Arbez M., 1971). Therefore, black pine cultures are very important in forest theory and practice (Antić M., Jović N., Avdalović V., 1988). However, it should be mentioned that huge part of black pine cultures is located in other habitats, whose so-called ecological value is higher than black pine reqiores. In other words, black pine is in the terrain where all soil potential can't be completely used (Tomanić L., 1968).

The area of black pine cultures in Serbia occupies 65.200ha, which is huge amount, taking account only species. The total black pine wood volume consists of 3,099.385m^3, which represents a big potentials in ecological and economic sence. Current volume growth for 10 years raises to 1,435.154 m^3. All these facts deserve attention, and are also encouraging, but on the other hand, but burdened with the forest science findings (National forest inventory, 2012).

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II. Description and Methodology of the Research Area

The research area is the forest management area of Kragujevac. This area consists of forestry unit in Gornji Milanovac and the one in Kragujevac as well. Concrete measures on the black pine cultures were done in the area of Gruža-Lepenica-Jasenica forest, which belongs to the forestry unit of Kragujevac.

Gruža-Lepenica's forests spreads in the area of 2949 ha, of which 285 ha are forest cultures. This is almost 10 percent of all the cultures, mostly for black pine cultures.

a) *Experimental fields establishment*

Description of habitats: The research area is the altitude of 400-470 m, with the slopes gentle to moderately steep between 5 and 20 degrees, with western, and southwestern exposure. Forest cover is partially represented with unfavorable process of humification, poorly dead forest litter, the substrate of clay, ferruginuos and quartz sandstone, and serpentinite. Thus the following types of land are defined:

Eutric brown land, located in the first and third experimental field.

Ilimerised acid brown soil, located in another experimental field.

Finally, *eutric silicate land*, located in the fourth and fifth experimental field, being the least productive land.

Experimental fields forming has exceptional meaning, since the choice of experimental fields will affect the information from the terrain in every way. Experimental fields have the size of 25a (50mx50m). 5 sample plots were defined, a representative sample of the investigated area. The less experimental field, with the bigger factor –F is (to convert to hectares), so the possibility of making mistake becomes bigger. (Tokar F, 2005). On the other hand, if experimental field is too big, the less –F is, the possibility of making mistake is smaller. Yet, the experimental field is huge, with more measures which increases percentage of mistake. 25a of fields are the most appropriate, and F=4 the most compact, as shown well in practice (Durkaya *et all*. 2009) In experimental field selection the tape, theodolite and compass were used.

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b) Data collection

Data collection included diameter measure, tree height measure and the length of tree top. All data are entered into the database.

i. *Diameter measurement*

Diameter measurement was done on every black pine tree within experimental fields, at the height of 1,3m. Diameter measures are very important because the volume accuracy depends on the accuracy measures and subsequenly, on height measures. (Kostadinov *at all* 2006).

Each tree has been measured the diameter from all sides and the mean value is calculated. Measurements were done by Vernier scale, with a particular attention to the correctness (large jaws had to be in parallel). After measuring each tree in the field and all the values summed and divided by the tree number, so the medium diameter -Ds-. This value is important for defining the mean value of basal area –G-, and the trees are sorted by their thickness level.

ii. *Height measurement*

Height measurement was also done for each black pine tree within all experimental fields. It was done by "Blume-Leis" altimeter. The use of the altimeter requires an extra worker to hold the ruler and the heights can be measured from the distance of 15, 20, 30 or 40 meters.

Similarly to the diameter, after measuring, all the values are summed and divided by tree number, so the mean height of the stand –Hs is calculated. Successively, the trees are classified into height levels in order to make the height curve. (Barčić *at all* 2010).

iii. *Volume determination*

Volume calculation was done in the following procedure. Firstly, the trees are classified by their thickness level, with the defined each thickness level, which are 5cm wide. When every volume level was calculated and all value levelsgathered, this led to the result of the value of concrete experimental field. It was later converted into hectares, which was also done to each measuring element. These values were tested by calculating volume of the medium tree stand (based on Ds and Hs) multiplied by tree numbers in the stand. (Touchan *at all* 2012)

iv. *Study the depressed, the residual black pine trees and their contribution to ecology*

Black pine trees, which are underdeveloped, depressed, could give their best in the development, growth and population growth and ecology of the studied areas. All such trees will be particularly marked in the field such as backward and depressed trees when free of the influence of dominant trees, when overdue, give the maximum. As known, the black pine can regenerate power gain yet.

III. The Results of Research

The two photos are good, dominant black pine trees and the trees that are,, bad, depressed, backward, but that could be regenerated by a special measure:

Figure no. 1: Depressed tree before release, a measure of care

This is new for forestry science. THIS IS THE END OF AN, THEORY OF DOMINANT TREES IN FORESTRY, long been believed that should favor the dominant trees, and cut, depressed trees. Cultures of black pine to deny. This will greatly change flow of forest science. Note, that this is only discovered the black pine. For other species has not been proven.

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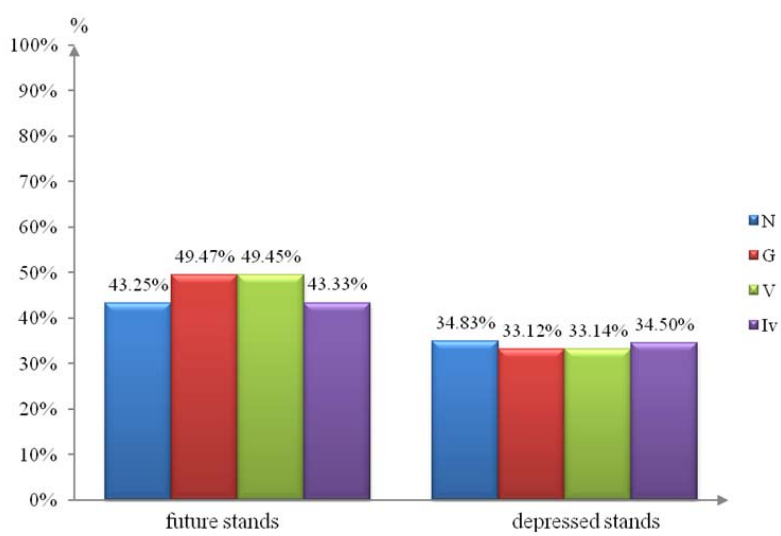
Figure no. 2 : Depressed tree after the release of the shadows, after implementation of care

Depressed tree in cultures, in all cultures, and especially black pine, can make a major ecological contribution, release of the shadows, so-called dominant trees. Dominant trees are in the theories of silviculture during the 19th and early 20th century was the center of attention of breeders of forest, a depressed or backward tree thus fell into the second plan. Since the dominant trees gave its maximum in the woods, culture and science, it is time to liberate the depressed trees so that they c an give the maximum in the growth, yield and ecology. With an obvious example in the pictures, this would be a major reversal of Forest Science.



Histogram no.1.

dominant black pine tree, in the first experimental field.(left)
depressed black pine tree in the first experimental field. (right)

Explanations:

N ..... number of trees in %
G ..... basal area (the cross-trees) in %
V..... The volume of trees ....%
iV ... increment%

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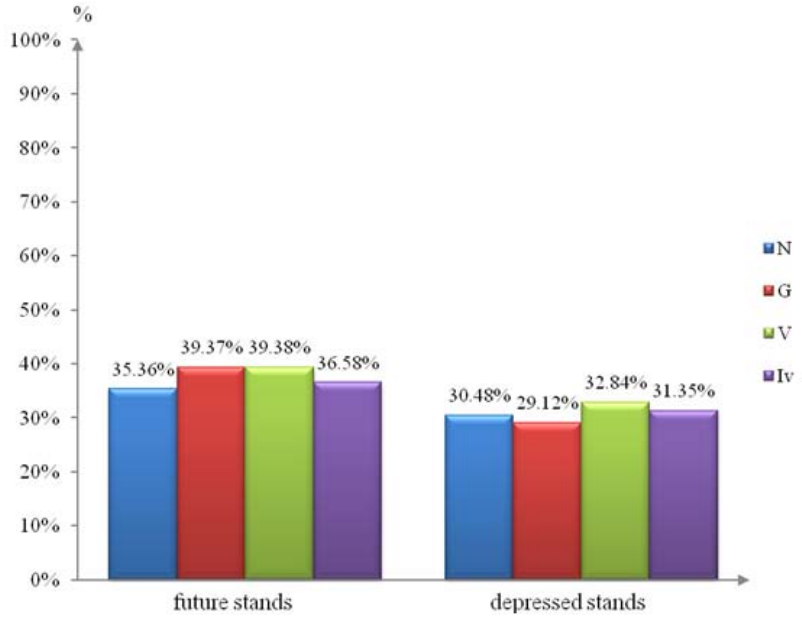
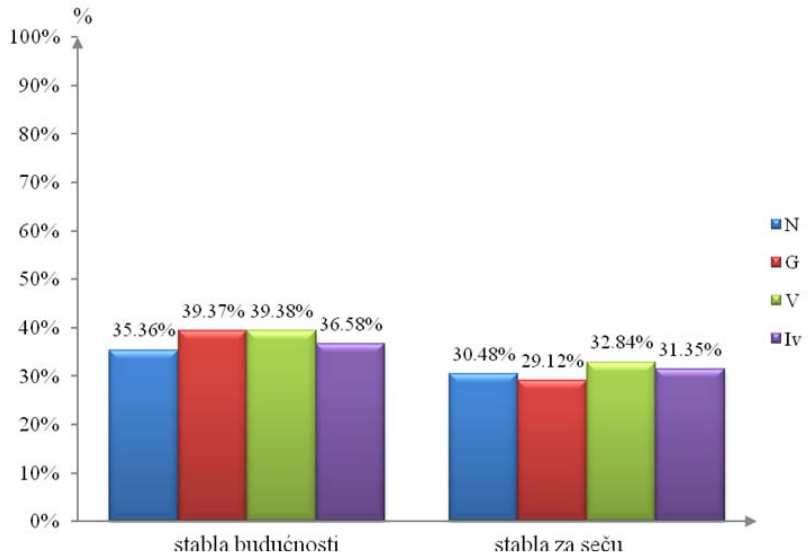


Histogram . no.2.

dominant tree black bra in another experimental field. (left)
depressed black pine tree in another experimental field.(right)

Explanations:

N ..... number of trees in %
G ..... basal area (the cross-trees) in %
V..... The volume of trees ....%
iV ... increment%



Histogram no.3.

Dominant black pine tree in the third, the experimental field.(left)
depressed black pine tree in the third experimental field.(right)

Explanations:

N ..... number of trees in %
G ..... basal area (the cross-trees) in %
V..... The volume of trees ....%
iV ... increment%

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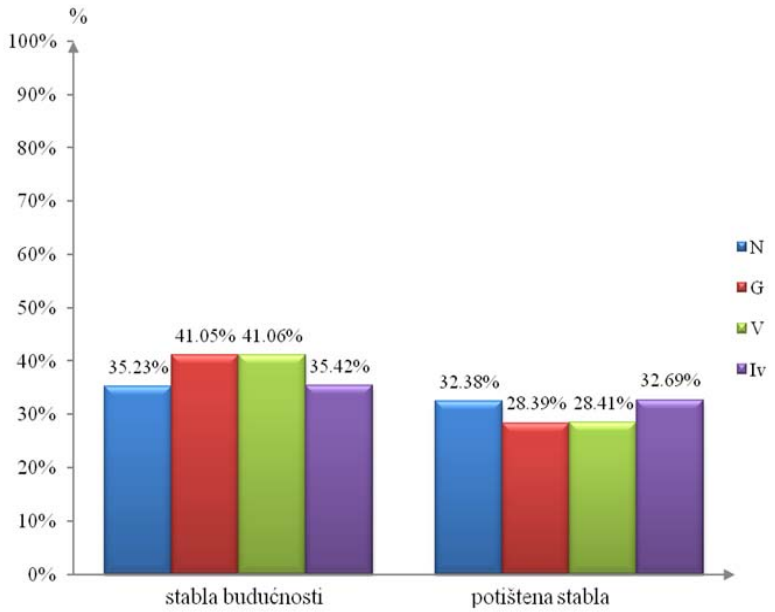
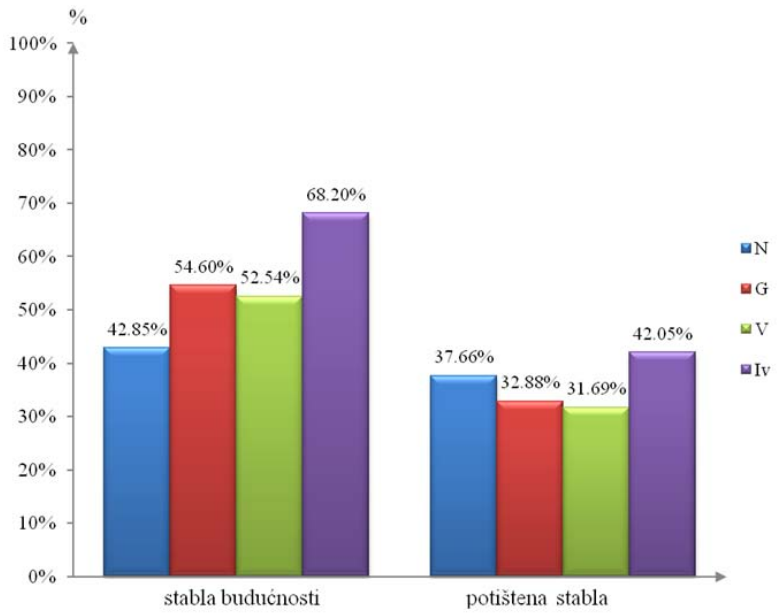


Histogram.no.4.

dominant black pine trees in the fourth experimental field.(left)
depressed black pine trees in the fourth experimental field (right)

Explanations:

N ..... number of trees in %
G ..... basal area (the cross-trees) in %
V..... The volume of trees ....%
iV ... increment%



Histogram .no.5.

Dominant black pine tree in the fifth experimental field.(left)
depressed black pine tree in the fifth experimental field. (right)

Explanations:

N ..... number of trees in %
G ..... basal area (the cross-trees) in %
V..... The volume of trees ....%
iV ... increment%

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a) Ecology of Black Pine

The cultures of black pine were established in the past on the researched territory, since half of the last century. Of course we have a culture that have been established in later, 196o's, 1970's and even 1990's of the last century. Typical and common to all cultures of black pine is that they require the necessary measures of care. In future more cultures of black pine are plannedin almost all habitats, being an excellent filter for the atmosphere and with the inceasingly polluted air. After the application of measures to tend the culture of black pine, they are expected to develop, grow and give a significant ecological importance.

IV. Discusion

Care measures in the cultures of black pine are expected to be implemented as early as possible, 10 to 20 year time(Stojanović Lj., 2008)

a) Process of tending for the first experimental field

Recommended low thinning – medium strength with thinning intensity of 5-8 years. The action strength by tree number is N-33%, by basal area G-30,36%, by volume V-30,42% and by current volume growth Iv-31,7%.

b) Process of tending for the second experimental field

Recommended high thinning- with the best tree selection for the future tress, as foundation of future development and growth- with thinning intensity of 8-10 years. The action strength by tree number is N-34,83%, by basal area G-33,12%, by volume V-33,14% and by current volume growth 41,66%.

c) Process of tending for the third experimental field

Recommended selective thinning moderate strength with selection of tress of future, and with thinning intensity of 5-8 years.

d) Process of tending for the fourth experimental field

Recommended stronger selective thinning with selection of certain trees of future numbers, with thinning intensity of 8-10 years. The action strength by tree numbers is N-32.38%, by basal area G- 28,39%, by volume V-28,41% and by current volume growth Iv-36,25 %.

e) Process of tending for the fifth experimental field

Recommended stronger thinning, in order to remove every low quality phenotype, with thinning intensity of 5-8 years. The action strength by tree numbers is N- 37, 66%, by basal area G-32,88%, by volume V-31,69%, and by current volume growth Iv-31,84%.

V. Conclusion

Black pine, precisely black pine cultures in this area, have shown justification of black pine infiltration into better habitats. Not only the height, but the diameter is much bigger in better habitats within the cultures of the same age. Mean diameter of pine cultures of 55 year-of-age in better habitat is Dg-31,4cm, while mean diameter of other pine cultures of the same age in worse habitat and soil is Dg-29,80cm. The same is with younger pine cultures. In the first experimental field in better habitat Dg is 16,5cm, aged 30 years and the other pine culture of the same age in worse habitat Dg is 16cm. The structure of the study stands there by diameter and height levels typical bell-shaped curve means a high-aged stands with volume increase which has declined in the last five years in all five experimental fields, especially in older cultures. There is a difference in volume especially in younger cultures as a consequence of the overall impact of habitat land. The negative impact on the development of the black pine have delayed the measures, and before applying adequate measures of care-thinning, in order to avoid even greater stagnation in the rise and development of the black pine.

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Glycerine Analysis of Beniseed *(Sesanum Indicum)* Oil, Biodiesel and Blends

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Abstract- Beninseed oil was extracted using soxhlet extraction method and transesterified to biodiesel using sodium methylate. The oil and its biodiesel were characterized according to American Society for Test and Materials (ASTM) protocols; the fatty acid profile was determined by gas chromatography analysis method, the glycerine content was measured to estimate the completeness of the reaction while the mineral contents were measured by atomic absorption spectrophotometer. The results obtained shows that the properties are within the ASTM limits and similar to those of diesel fuel which led to the conclusion that is can be used as alternative fuel for diesel engines. Of particular interest is the cetane index of 50, which is higher than that of diesel which will allow it to be used neat in diesel engine except that the viscosity of 32 mm2/s is too high for direct use in diesel engine. The oil is 83.948% unsaturated and consists mainly of 35.075% oleic acid and 45.78% linoleic acids.

Keywords: *beniseed oil, biodiesel, characterization, mineral contents, fatty acid profile.*

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Glycerine Analysis of Beniseed *(Sesanum Indicum)* Oil, Biodiesel and Blends

E.I. Bello [α] & A. Mammon [σ]

Abstract- Beninseed oil was extracted using soxhlet extraction method and transesterified to biodiesel using sodium methylate. The oil and its biodiesel were characterized according to American Society for Test and Materials (ASTM) protocols; the fatty acid profile was determined by gas chromatography analysis method, the glycerine content was measured to estimate the completeness of the reaction while the mineral contents were measured by atomic absorption spectrophotometer. The results obtained shows that the properties are within the ASTM limits and similar to those of diesel fuel which led to the conclusion that is can be used as alternative fuel for diesel engines. Of particular interest is the cetane index of 50, which is higher than that of diesel which will allow it to be used neat in diesel engine except that the viscosity of 32 mm2/s is too high for direct use in diesel engine. The oil is 83.948% unsaturated and consists mainly of 35.075% oleic acid and 45.78% linoleic acids. It contains sodium, potassium, calcium, magnesium, sulphur and phosphorus and they are all within the ASTM limits. The variation of glycerol in the oil, B100, B20 and B10 were measured to estimate the completeness of the transesterification reaction. The results shows that the oil has high concentration of triglyceride (TGE), B100 has low concentration of diglyceride (DGE) and TGE which confirms the high degree of completeness of the reaction. For B20, DGE and TGE are dominant while DGE has the highest concentration in B10.

Keywords: beniseed oil, biodiesel, characterization, mineral contents, fatty acid profile.

I. Introduction

Beniseed (Sesamum Indicum) belongs to the family of Pedaliaceae. It is widely grown in the North Central States of Nigeria and it is the 6th largest producer and the 5th largest exporter in the world (FAO, 1992). It has different varieties, the notable ones being white, yellow and black. The seeds are spherical, 2.5 - 3 mm diameter depending on the variety and has an oil yield of 42- 54% and protein 22 % (Hui, 1996; Bedigian, et al., 1985). It can be consumed fresh, dried or fried after dehulling. It can also be blended with sugar and usually have a milky flavor. It is also used as a paste in some local soups (Fariku et al., 2007). The oil is one of the most sought after because it contains unsaturated fatty acids and the colour vary from crystal clear to yellowish brown depending on the variety. It has excellent taste, very stability due to the presence of antioxidants such as sesamolin, Sesamine, and sesamol. It is odourless after refining and the characteristics are similar to olive oil (Weiss, 2000). It has several industrial applications that includes for the production of margarine, confections, canned sardine, corned beef, soap making and ink. (Sangha et.al, 2004, Sudhir et al., 1996; Betiku et al., 2012; Mohammed and Hamza, 2008; Njoku et al., 2009).

The oil is essentially a triglyceride and therefore, a possible feedstock for biodiesel production. Biodiesel is a form of mono alky ester of oil obtained from vegetable oil or animal fats (Knothe, 2005; Mittelbach et al., 2004; Srivastava, 2000). It is chemically simple, consisting of between six and nine fatty acid esters in the mixture. It is highly biodegradable, has agricultural source and renewable. It has inherent lubricating properties and wets the surface. The flash point is much higher than that of diesel and produces less harmful exhaust emissions. It is produced by the method of transesterification, which is the process of converting vegetable oil to esters using alcohol in the presence of a catalyst to chemically breakdown the molecules of the vegetable oil, remove glycerol from the triglycerides and replace them with radicals from the alcohol used. The reaction transforms the branched molecular structure of vegetable oil into a straight chain but smaller molecular structure, which is identical to but much longer than that of diesel fuel (Meher et al., 2006) and result in the formation of mono alkyl esters (Knothe, 2005; Mittelbach et al., 1985; Srivastava and Prasad, 2000).

Vegetable oils and animal fats are triglycerides made by living plants from fatty acids and glycerol. A triglyceride is a mixture of different glyceride esters of fatty acids in which each glycerol molecules has attached to it three molecules of long chain monocarboxyl (free fatty) acids as shown in Fig.1. Fatty acids consists of a long chain of carbon atoms with a carboxylic acid group at one end and are essential for energy storage in lipids while glycerol is a trihydric alcohol (containing three-OH hydroxyl group) that can combine with 1, 2 or 3 fatty acids to form monoglyceride, diglyceride and triglyceride respectively.

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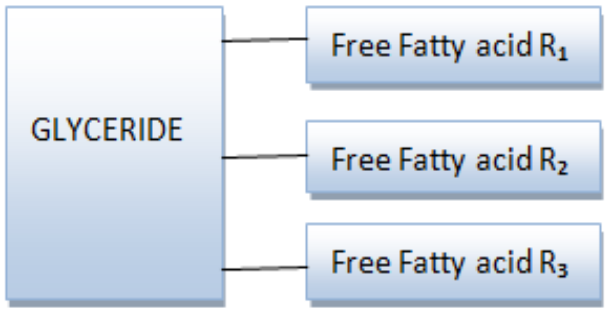

Fig.1 : Triglyceride Schematic

Transesterification is not a straight forward reaction as it occurs in a series of three reversible steps during, in which the triglyceride that consists of three fatty acid molecules attached to a glycerol backbone is first converted to diglyceride that contains two fatty acids and then to monoglyceride which contains only one molecule of fatty acid methyl ester (FAME). During the process, the reactions may not be complete and the triglycerides in the oil may still contain 3, 2 or 1 glycerol molecule(s) that have not been released. Such glyceride are said to be bounded glycerol. The sequence of deglyceriding is shown in Equations 1-3. (Schwab et al., 1997; Freedman et al., 1986; Ferella et al., 2009; Schuchardt et al., 1998).

$$\text{Triglyceride} + CH_3OH \leftrightarrow \text{Diglyceride} + \text{FAME} \quad (1)$$

$$\text{Diglyceride} + CH_3OH \leftrightarrow \text{Monoglyceride} + \text{FAME} \quad (2)$$

$$\text{Monoglyceride} + CH_3OH \leftrightarrow \text{Glycerol} + \text{FAME} \quad (3)$$

MGE is the most stable intermediate compound (Ma and Hanna, 1999) and the most important determinant of the completeness of the reaction.

The glycerol is bounded if it has not been freed from the fatty acids.

$$\text{Total glycerol} = \text{bounded glycerol} + \text{free glycerol} \quad (4)$$

As a result of incomplete reactions, small amounts of monoglyceride, diglyceride and triglyceride will remain in the biodiesel even after washing along with other impurities. They can affect the properties of the biodiesel if not limited.

For example, fatty acids are very volatile while the glycerol they are attached to has high boiling point and is more viscous. This suppresses the volatility of triglycerides, which increases the viscosity of plant oils to within the range 45 - 32 mm^2/s.

If the glycerol level in a fuel is high, because of it high viscosity, some of its contents will settle out in the fuel tank to form very viscous mixture, which can attract solid particles, increase the viscosity of the fuel and may cause blockage of filter and consequently restrict fuel flow. Such fuels are prone to coking and may thus cause the formation of deposits on injector nozzle, piston and valves that can affect fuel economy.

The concentration of each compound depends on the completion of the transesterification process. Total glycerol affects storage stability which is a measure of how well the quality of the fuel will be maintained in storage when in contact with air or water.

II. Materials and Methods

a) *Oil extraction*

The oil was extracted in a soxhlet extractor using n-hexane as solvent. It gave an oil yield of 48 %. This method is superior to the traditional method of oil extraction that involves grinding to flour and treating with hot water to cream out the oil. This method is slow, the yield is low and the oil produced has unpleasant odour and bitter taste (NCIR, 2002; UNIFEM, 1987; Igbo et al., 2005).

b) *Fatty Acid Profile*

The fatty acid profile and glyceride contents of the samples were determined using the HP 6890 Gas Chromatography analyzer equipped with a Flame Ionization Detector (FID) and HP INNOwax column (30 m x 0.25 cm x 0.20 µm film thicknesses). The carrier gas was nitrogen and the initial temperature of the oven was set at 60° C. The procedure was as reported by Bello and Otu (2012) in which the first ramping was at 10° C/m for 20 minutes and maintained for 4 minutes. The second ramping was at 15° C/min for 4 minutes and maintained for 10 minutes. The detector temperature was 320°C while hydrogen and compressed air pressures were 22 and 35 psi respectively.

c) *Characterization*

The oil. B100, B20 and B10 were characterized according to ASTM protocols for biodiesel.

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III. Results and Discussion

The experiment was designed to monitor the concentrations of TGE, DGE and MGE in the oil, and B100 when the fatty acid profiles are being determined.

a) Concentration of TGE, DGE and MGE oil

The variation of TGE, DGE and MGE in the oil is shown in Fig.1. The oil as expected has a large concentration of TGE. DGE and MGE are intermediate compounds and are in very low concentration because no transesterification reaction that would have produced them had taken place. The highest concentration of TGE monitored was 20 000 x 10-3 mg/100g. The oil is fairly stable and contains 0.513% free glycerin.

b) Concentration of TGE, DGE and MGE in B100

Concentration of TGE, DGE and MGE in B100 is shown in Figure 2. It contains very low concentration of DGE and TGE that remained after the transesterification process. The low concentration of these compounds attests to the completeness of the transesterification reaction. The highest concentration was 0.012 mg/100g.

c) Concentration of TGE, DGE and MGE in B20

B20 contains TGE, DGE and MGE. The dorminat ones are DGE and TGE. The highest concentration is 0.007 mg/100g of DGE. As shown in Figure 3.

d) Concentration of TGE, DGE and MGE in B10

As can be seen in figure 4,TGE, DGE and MGE are present in the fuel but DGE has the highest concentration of 0.005 mg/100g. The composition of B10 and B20 are not very different.

e) Variation of TGE concentration

The variation of TGE in the 4 samples is shown in Fig. 5. The concentration is highest in the oil and only very little concentration in the other samples. The highest concentration in the oil is 20 000 x 10-3 mg/100g. The concentration decreased with time because it is an intermediate compound and peaked after 18 minutes.

f) Concentration of MGE

MGE concentration varies as shown in figure 6. It has the highest concentration in the oil of 70 x 10-3 mg/100g. The concentration of other samples is very low.

In general, triglyceride is dominant in the oil and reduced after transesterification due to removal of the fatty acids for conversion to biodiesel. Diglyceride and monoglyceride which are intermediate compounds are only present in the oil in significant amount. They are unstable compounds and easily react with air to form solid compounds in the form of sediments and gum, which can disrupt the effectiveness of fuel filters, fuel pump and injection systems. It can also cause abrasive substances to be embedded in them that can increase engine wear.

g) Physico-chemical properties of Oil and B100

The result of the characterization is shown in table 2.

Table 2 : Properties of Beniseed Oil and B100

Property	Oil	B100
Flash point (ºC)	218	165
Kinematic Viscosity (mm^2/s at 40ºC)	32.00	4.02
Lower heating value (MJ/kg)	38.20	39.90
Cetane number	50.88	58.80
Iodine value (g/100g)	108	88.20
Peroxide value (meq/kg)	0.49	0.54
Oxidation index (hrs)	18	12
Free fatty acid (%)	0.75	0.12
Acid value (mgKOH/g)	0.50	0.27
Saponification value (mgKOH/g)	190	135.6
Free Glyceride (%)	0.513	0.038

Flash points are higher than the 55oC of diesel and the oil has a flash point of 218oC which is primarily TGE.

The oil, because it is a TGE has a kinematic viscosity of 32 mm2/s and reduced to within the limits for biodiesel after transesterification and blending.

The heating values for the oil are within the range for common vegetable oils of 38 - 42 MJ/kg.

The cetane number of 50.88 for the oil is above that of diesel fuel making it a suitable fuel for diesel engine even without transesterification.

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The iodine value of the oil of 108.00 makes it a semi – drying oil suitable for the production of surface coatings, decorative paints, varnishes, printing inks etc. The value for the biodiesel of 80 will not allow for high formation of carbon deposits in the engine.

Peroxide value measures the content of hydroperoxides in the oil and its low value indicates high resistance to oxidation. The value of 0.49 for the oil is low as should lead to long shelf life for the oil.

The oil is the most stable because of the TGE content and has an oxidation index of 18 hours while the B100 has a lower value of 12 hours. (Arisoy, 2008)

The low acid value (0.5 mg KOH/g oil) of the seed oil showed that it is not only edible but could also have a long shelf life. It can also be converted to biodiesel directly without pretreatment.

The high saponification value of 190.00 mg of KOH/g for the oil confirms it suitability as feedstock for the manufacture of soap and detergents.

The free glycerol contents of the oil and B100 are 0.513, 0.038% respectively. The free glycerol decreased after transesterification. The total glycerol after transesterification is below the ASTM D 6751 and EN 14214 maximum limits. Total glycerol affects storage stability which is a measure of how well the quality of the fuel will be maintained in storage when in contact with air or water.

h) Fatty Acid Profile

The fatty acid profile of Beniseed oil and B100 is shown in table 3.

Table 3 : Fatty Acid Profile of Beniseed oil and B100 (% wt)

Fatty Acid	Form	Oil	B100	Change(%)
Palmitic	C16:0	8.83	8.690	1.5
Palmitoleic	C16:1	0.056	0.0319	43.2
Stearic	C18.0	6.236	6.418	6.4
Oleic	C18:1	38.07	37.770	-0.79
Linoleic	C18:2	45.76	46.526	1.6
Linolenic	C18:3	0.062	0.0335	-45
Arachidic	C20:0	0.067	0.0360	-46.2
Behenic	C22:0	0.911	0.495	-45.7
Saturation	-	16.043	15.639	-2.5
Unsaturation	-	83.948	84.461	- 0.06

The oil is 83.948% unsaturated and does not contain any triple bond, which is responsible for the excellent shelf life. It contains mostly the oleic series of fatty acids of which oleic acid constitutes 38.07%. For industrial scale production, it will be necessary to pretreat the oil to convert some of the fatty acids to esters so that it will not inhibit biodiesel yield during transesterification.

IV. Conclusions

The banished oil and biodiesel have good fuel properties and can be blended with diesel fuel in any proportion. It has a cetane index of 57 which is one of the highest for vegetable oils. The oil is 83% saturated and has an iodine value of 108. From the results obtained, it can be used as alternative fuel for diesel engines. The complexness of the transesterification was confirmed by the low concentration of DGE and TGE.

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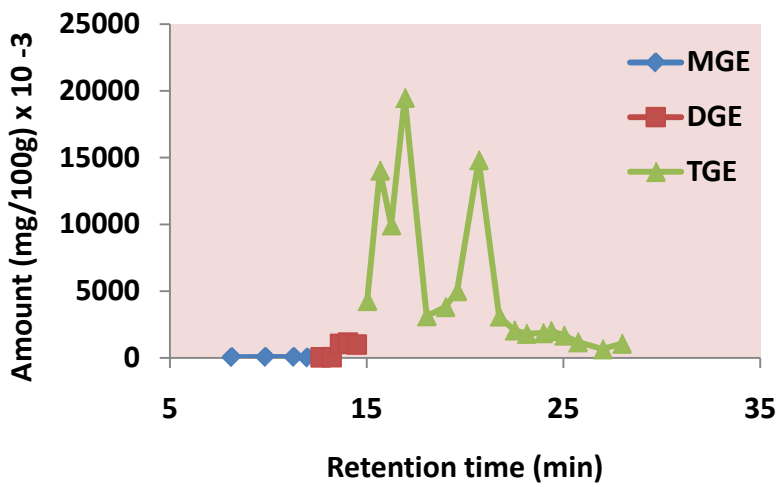

Fig. 1 : Glycerine analysis of Beniseed oil

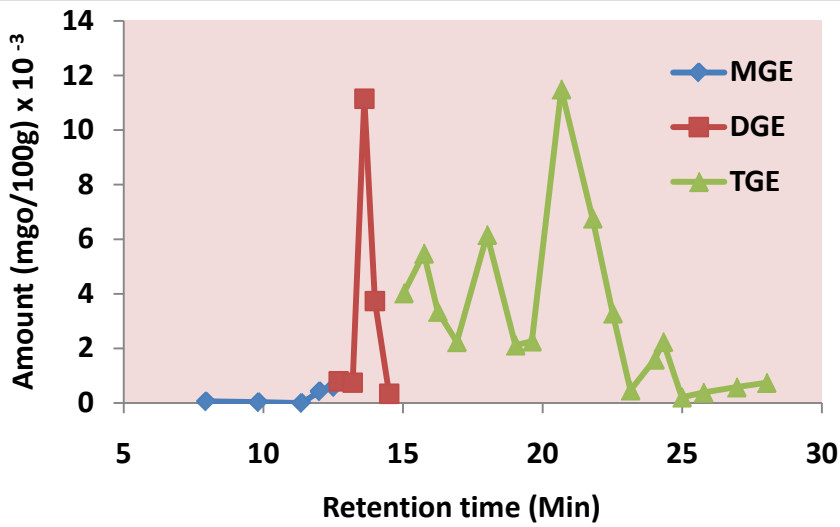

Fig. 2 : Glycerine analysis of Beniseed B100.

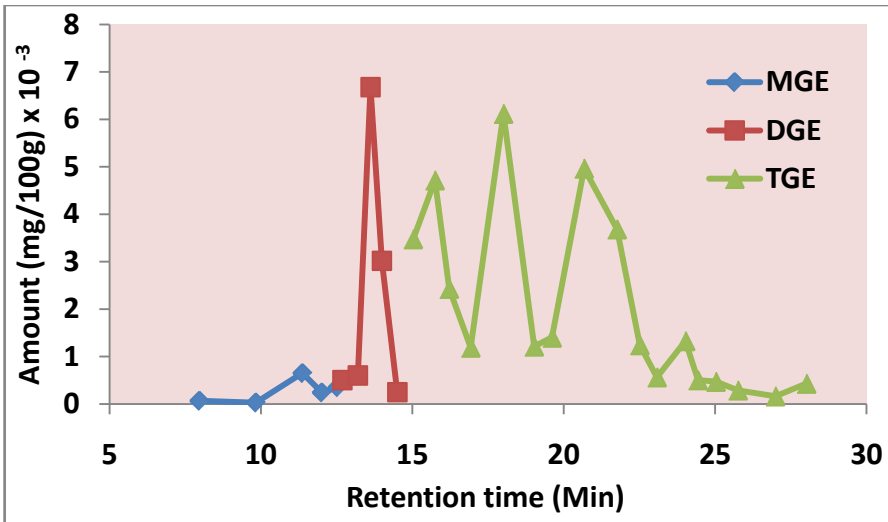

Fig.3 : Glycerine analysis for Beniseed B20

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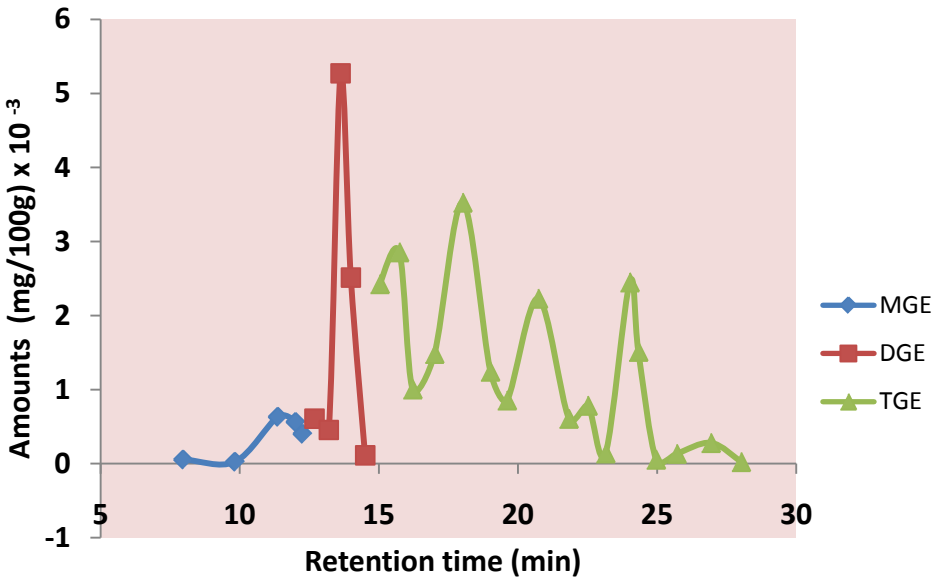

Fig. 4 : Glycerine Analysis of Beniseed oil B10

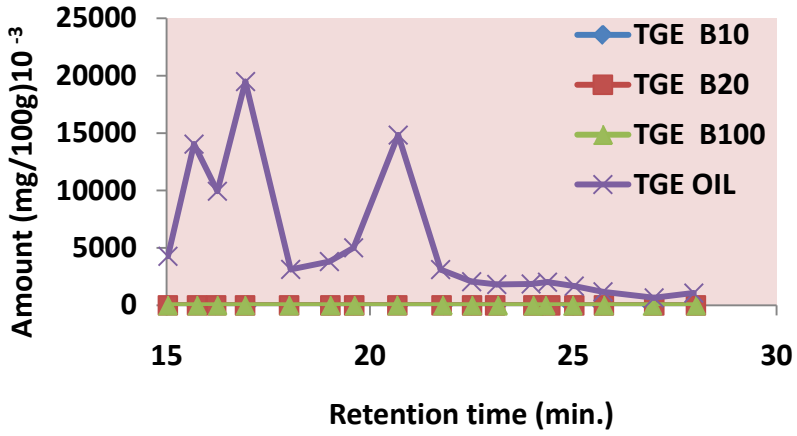

Fig. 5 : Variation of TGE in the samples

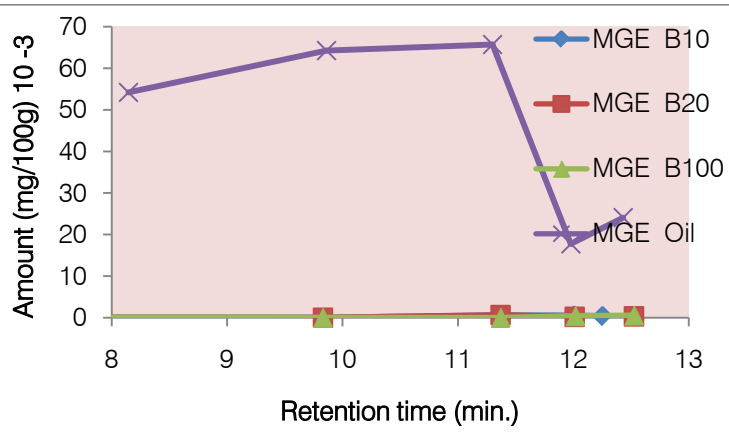

Fig. 6 : Variation of MGE in the samples

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Factors Influencing Pregnant Women's Utilization of Maternal Health Care Services for Delivery in Ogun State, Nigeria

By C. O. Agbede, G. N. D. Aja & P.S Owolabi
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Abstract- The study assessed the factors influencing the utilization of Maternal Healthcare Centers (MHC) for delivery among pregnant women attending ante-natal care in Ikenne, Ogun state, Nigeria. A total of 96 respondents were selected from 5 MHC for the study using the multistage sampling procedure. All the women were monitored till delivery. Furthermore, 48 (50%) of the respondents were randomly chosen and exposed to motivational telephone calls for 6 weeks preceding delivery dates. Structured questionnaire was used to gather data which were analyzed using descriptive statistics and logistic regression. All analyses were measured at $p \leq 0.05$ level of significance. Results showed that most of the women were between 30 and 34 years old, had up to secondary education, recorded parity of 1-2 while timing of first visit was between 20 and 24 weeks of gestation and number of Ante-natal visits were $\geq$ 4. Monthly income was generally less than N16,000 (~$80). Some 52% of the women gave fair rating for the services received from the healthcare workers and 58% used the MHC for delivery. However, 84% of those who received telephone calls used MHC for delivery while 59% of those who did not received telephone calls used MHC for delivery.

Keywords: *maternal healthcare, pregnant women, telephone follow-up, nigeria.*

GJSFR-E Classification : *FOR Code : 321299*

FACTORSINFLUENCINGPREGNANTWOMENSUTILIZATIONOFMATERNALHEALTHCARESERVICESFORDELIVERYINOGUNSTATENIGERIA

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Keywords: maternal healthcare, pregnant women, telephone follow-up, nigeria.

I. Introduction

Utilization of Maternal Healthcare Services (MHS) is associated with improved maternal and neonatal health outcome (Babalola and Fatusi, 2009) and reduction in maternal deaths (UNICEF, 2003). Ante-Natal Care (ANC) is expected to provide pregnant women with necessary information and risks and to enhance their utilization of MHS (Iyaniwura and Yussuf, 2009). About 75% of all maternal deaths are those associated directly and indirectly with some sort of complications during delivery and the week immediately after (Choudhry, 2005). It is therefore crucial that pregnant women should be attended to by skilled attendants (trained doctors, midwives, trained nurses or trained community health officers) (FMOH, 2009).

In developed countries an estimate of 97% pregnant women receive ANC and 99% use skilled obstetric services at delivery while in developing countries 63% and 53% of women use ANC and skilled obstetric care respectively (Agbede et al., 2015). This implies that sometimes women who received ANC from skilled personnel still end up patronizing unskilled obstetric services at delivery. In Nigeria and many other developing countries, pregnant women view the event of child birth with apprehension of possible pain and death unlike the situation in most developed countries (Ekele, Bello, Adamu, 2007). The trust in the healthcare facility to reduce this fear is low and some will even prefer to use the tradition birth attendants for delivery (Agbede et al., 2015). Proportion of deliveries attended to by skilled health personnel in Nigeria declined from 43% in 1990 to 38.9% in 2008 (MDGs, 2010). Although it rose to 53.6% in the year 2012, the trend is currently on the decline despite the interventions put in place (Agbede, 2015).

The study of Agbede (2013) showed that the rate of utilization of MHS in the Public Healthcare Centers (PHC) around Ikenne in Ogun state, Nigeria, has been consistently below 50%. Personal attributes of the pregnant women and level of professionalism displayed by the birth attendants are common correlates of utilization of MHS posited by past studies (Iyaniwura and Yusuf, 2009; Agbede et al., 2015). Therefore, increasing utilization of MHS for delivery require special skills and attitudinal changes from both the providers and the clients.

Two recent international initiatives recommended the use mobile phones as additional instrument in healthcare delivery and a means to boost utilization of MHS for delivery (International Telecommunication Union [ITU] 2009). The Millennium Development Goal 8 also highlighted the need to make use of new technologies available, especially those related to information and communication to improve healthcare delivery. Since the fastest growing new

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technology worldwide is the mobile phone, the need to research into the influence its intervention on enhancing the use of PHC centers for delivery is pertinent and of current importance.

According to Erhunwmunsee (2012), there are over eight million telephone subscribers in Nigeria. Thus, the mobile technology can be utilized for education, intervention and follow-up as obtained in other parts of the world (Lund et al., 2009; Mechael, 2005; Samai and Sengeh, 1997; Musoke 1999; Matthews and Walley 2005; Lungu and Ratsma 2007; Fournier et al., 2009; Svoronos et al., 2010).

In Nigeria, Isola (2011) observed that the use of mobile telephone by pregnant women to communicate with their health rangers improved patronage of trained midwives and qualified personnel thus supporting the potential of its ability to enhance utilization of MHS especially when it is purposefully used to reinforce ANC education as detailed in this study. Thus, this paper (an extract from a study) assessed the factors influencing pregnant women's utilization of Maternal Healthcare Services (MHS) for delivery in Ikenne, Ogun state, Nigeria while hypothesizing the women's personal attributes and use of mobile phone reinforcement of ANC education as determinants.

II. Methodology

This study was carried out in Ikenne Local Government Area (LGA) in Ogun state, Nigeria. This LGA is semi-urban comprising of five towns- namely, Ikenne-Remo (the LGA headquarter), Ilishan-Remo, Iperu-Remo, Ogere-Remo and Irolu-Remo. Population of women of reproductive age in the study area was 27, 713 (Nigeria Demographic and Health Survey, 2009). However, the target population included women who were pregnant and in the third trimester of pregnancy (28-40 weeks of pregnancy). The MHS available within the LGA include Babcock University Teaching Hospital at Ilishan, State General Hospital at Ikenne, State Hospital at Iperu, Community Hospital at Ilishan and ten (10) Primary Health Care (PHC) Centres in Wards situated in the five towns. There are also eight registered Private Hospitals/Clinics, some Traditional Birth Attendants (TBA) and Religious Healthcare Centres (RHC) within the Local Government Area.

a) *Sampling technique and Data collection*

The multistage sampling technique was used to select 96 respondents from among the pregnant women attending antenatal in 5 (randomly selected) of the identified PHC in the study area as specified above. All the women were monitored from first registration for ANC till delivery to determine actual place of delivery. Furthermore, 48 (50%) of the respondents were randomly chosen, across the selected MHC, and exposed to motivational telephone calls for 6 weeks preceding actual delivery dates. Structured questionnaire designed in line with the study objectives was used to gather data from the respondents. Reliability analysis was applied to test the internal consistency of the questionnaire. Result of the analysis showed that the instrument was reliable with average Cronbach's alpha value of 0.82 (Graham and Gisi, 2008; Muhamad, 2010).

b) *Method of data analysis*

Descriptive statistics and the logit regression model were employed in analyzing data collected in the study. Frequency tables were used to present results for the descriptive analysis while the logit regression model was used to analyze the factors which influenced respondents' utilization of maternal healthcare services for delivery. All statistical analysis were done using the statistical package for social science (SPSS version 17) and set at $P \leq 0.05$ levels of significances. Ethical clearance was obtained from the Ethical Review Committee, Babcock University and consent forms were filled by all participants.

In the regression analysis, the dependent variable was the utilization or non-utilization of the maternal healthcare services by the respondents for delivery. This was coded as '1' representing utilization and '0' representing non-utilization (dummy variable). The independent variables were the respondents' personal attributes (demographic and income variables), exposure to previous intervention program or seminars emphasizing merits of utilization of healthcare services especially for delivery, number of previous births, previous experience with birth complications, proximity to healthcare center, satisfaction rating for healthcare workers, family influence and telephone reinforcement motivating utilization of healthcare services.

III. Results and Discussion

a) *Respondents' personal attributes*

Respondents' personal attributes analyzed included age, marital status, educational attainment, income, satisfaction rating for healthcare workers, parity and ANC visits. Results as presented in Table 1 showed that most of the respondents were between 30 and 34 years old (46%) and mostly married (98%). Most of respondents had relatively good level of education with majority having secondary education and above (81%). The nexus between education and response to innovations for behavioral change has been detailed in previous studies (Babalola et al., 2013; Omeonu et al., 2014). Thus education is expected to influence utilization of maternal healthcare services. Most of the women earned below ₦16,000 (<$81) (74%) which is clearly below the national minimum wage of ₦18,000. This implies that although, most of these women may depend on their husbands for household financial sustenance, poverty level is likely high among the

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women. This may pose a challenge to the women's' ability to make effective demand for necessary healthcare services.

Further results in Table 1 showed that the majority of the respondents (56%) had 1-2 children, thus they are expected to have certain knowledge about pregnancy management and probably formed opinions about where to deliver their babies since they have had children before. Results of antenatal care (ANC) showed that most of the women (70%) had their first visit to the healthcare center between 20th and 24th weeks of pregnancy. However, the majority of the respondents (63%) visited the healthcare facility up to 4 times during ANC. This is expected to positively influence utilization of the healthcare facility for delivery; unfortunately only 29 percent rated the service provided by the healthcare workers as good and this may negatively impact utilization.

Table 1 : Demographic information of respondents

Variables	Control (n= 96) Freq	%
Age		
19-24yrs	31	32.3
25-29yrs	21	21.8
30-34yrs	30	45.5
35-39yrs	8	8.33
≥40	6	6.25
Marital status		
Married	94	97.9
Education		
Below Secondary	18	18.8
Secondary and above	78	81.3
Husbands' Education		
Below Secondary	16	16.7
Secondary and above	82	85.4
**Income level (₦)*		
≤15,000	52	54.2
16,000-30,000	19	19.8
31,000-45,000	9	9.38
>45,000	16	16.7
Parity		
None	9	9.38
1-2	54	56.3
3 and above	33	34.4
Timing of ANC first visit		
8-16 weeks	12	12.5
20-24 weeks	67	69.8
28 weeks +	17	17.7
No. of ANC visits		
1 ANC visit	9	9.38
2 ANC visit	22	25.9
3ANC visit	5	5.21
4 and above	60	62.5
Satisfaction rating for HC workers		
poor	18	18.4
fair	50	52.3
good	28	29.3

* $1 is approximately ₦199

Source: Computed from field Survey (2014)

Table 2 : Distribution of respondents by decided actual place of delivery

Place of delivery	Selected MHC					
	Irolu (n = 10)	Ilishan (n= 10)	Ikenne (n= 28)	Ogere (n= 28)	Iperu (n= 20)	Total (n= 96)
MHC	2 (20%)	6 (60%)	12 (43%)	24 (85%)	12 (60%)	56 (58%)
Private Hosp	2 (20%)	2 (20%)	2 (7%)	3 (11%)	4 (20%)	13 (14%)
Church	6 (60%)	2(20%)	8 (29%)	1 (4%)	1 (5%)	18 (19%)
TBA	0 (0%)	0 (0%)	6 (21%)	0 (0%)	1 (5%)	7 (7%)
Home	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (10%)	2 (2%)

Source: Computed from field survey (2014)

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b) Respondents' actual place of delivery

Results in Table 2 shows that the majority of the respondents (58%) use the MHC for the delivery of their babies. Aggregating the data for MHC and private hospital, 72% of the respondents utilized skilled health attendants for delivery while 28% of the respondents still patronized unskilled birth attendants such as the Traditional Birth Attendants (TBA), church or religious centre and delivery at home (attended to by family or friend).

c) Impact of telephone follow-up and determinants of utilization of MHC

The result of the assessment of the impact of the telephone follow-up on use of MHC for delivery is presented in Figure 1. Fifty percent of the women (48 women) were followed-up by weekly mobile phone communications. Results showed that telephone follow-up led to an apparently increase in the use of MHC and decrease in the use of other facilities. Disaggregating utilization of MHC by telephone follow-up showed that 84% of those who received telephone calls used MHC for delivery while 59% of those who did not received telephone calls used MHC for delivery.

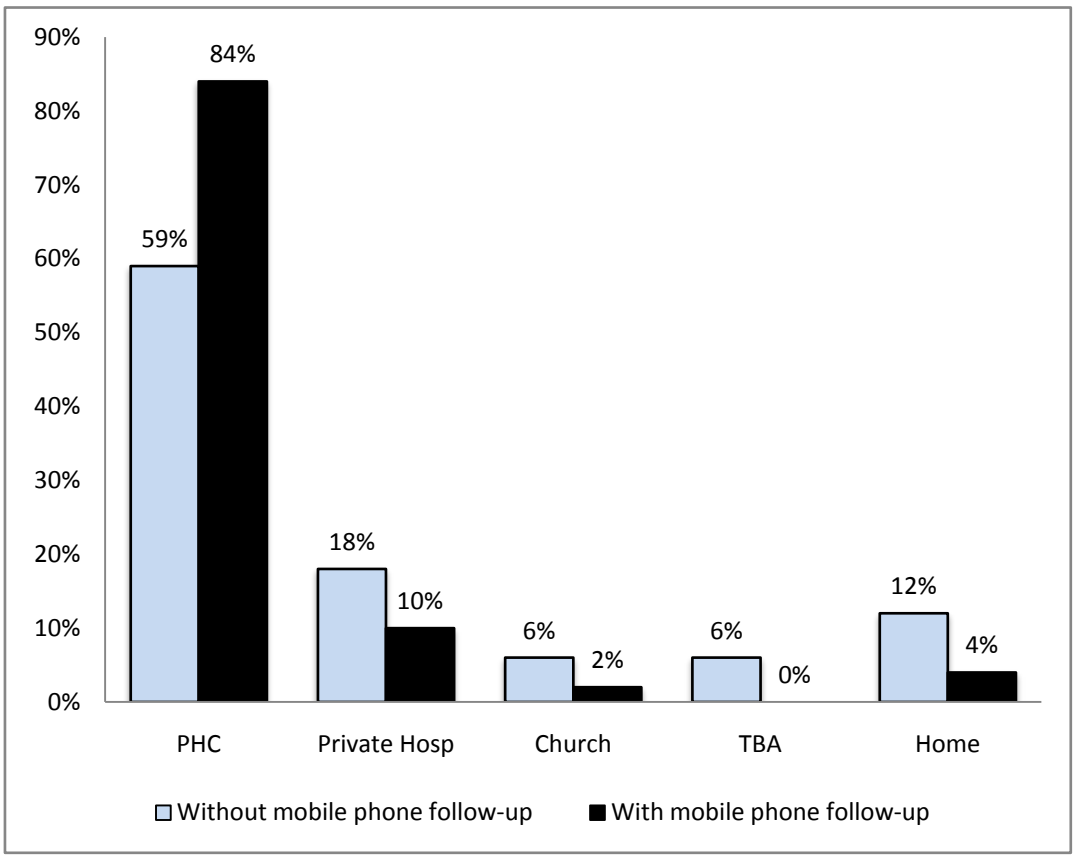

Fig. 1 : 'With' and 'without' mobile phone follow-up

The logistic regression analysis was conducted to determine the factors which significantly influence respondents' utilization of the healthcare facility for delivery and the results presented in Table 3. The analysis was done after mobile phone follow-up.

Results showed that respondents' participation exposure to telephone calls (reiterating knowledge received during ANC and motivating use of skilled birth attendants) significantly (at $p = 0.009$) increased the utilization of MHC for delivery. This result is consistent with the reports of Lund et al. (2009); Samai and Sengeh (1997); Musoke (1999); Matthews and Walley (2005); Lungu and Ratsma (2007). Other factors which positively and significantly increased respondents' utilization of MHC services included respondents' literacy level ($p = 0.006$), respondents' satisfaction rating for of healthcare workers at the MHC ($p = 0.003$), respondents' monthly income ($p = 0.042$) and family (especially husband) influence ($p = 0.047$). This implies that increasing these variables will significantly increase pregnant women's patronage of the MHC for delivery of their babies and by implication ameliorate complications attached to births attended by unskilled birth attendants.

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Table 3 : Factors influencing respondents' utilization of MHC facility for delivery

Independent Variables	Beta coefficient	S.E.	Sig.
Constant	-7.380*	1.773	0.010
Mobile phone follow-up (dummy: no = 0; yes = 1)	0.217*	0.0510	0.009
Literacy level (dummy: below sec = 0; sec & above = 1)	0.318*	0.079	0.006
Satisfaction rating of HC workers	2.359*	0.783	0.003
Number of previous births	-0.103	0.172	0.550
Proximity to HC facility (dummy: no = 0; yes = 1)	0.424	0.387	0.273
Number of ANC visits	0.305	0.180	0.095
Monthly Income (in naira)	0.130*	0.060	0.042
Family influence (dummy: no = 0; yes = 1)	0.289*	0.124	0.047

*Dependent variable is the actual utilization of healthcare facility (utilization =1; otherwise = 0); -2 Log likelihood = 122.504; Nagelkerke R^2 = 0.482; *sig ≤ 5%*

Source: Computed from field survey (2014)

IV. Conclusion and Recommendations

This study assessed the factors influencing the utilization of Maternal Healthcare Centers (MHC) for delivery among pregnant women. The participants were selected from among pregnant women attending ante-natal care in the healthcare centers in Ikenne LGA of Ogun state Nigeria. The investigation concluded by affirming significant impact of corroborative telephone-call motivation of respondents towards utilization of MHC. Similarly, respondents' literacy level, their satisfaction rating for of healthcare workers at the MHC, their monthly income and family (especially husband) influence positively influenced utilization of MHC for delivery. Based on the findings of the study, it is recommended that with the increase in availability of mobile communication services providers in Nigeria, phones should be intensively used for addressing health delivery bottle necks and motivating MHC utilization. Furthermore, careful considerations should be given to subsidizing maternal healthcare cost, conducting periodic appraisal of the quality of ANC education delivery and family ties when formulating policies or initiating programmes targeting maternal healthcare and utilization of MHC services.

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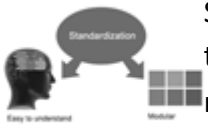

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2. Ethical Guidelines,

3. Submission of Manuscripts,

4. Manuscript's Category,

5. Structure and Format of Manuscript,

6. After Acceptance.

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The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

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- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

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- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

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The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

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- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
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- Do not present the similar data more than once.
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Approach

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- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
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- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

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References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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