Combined Effects of Aqueous Extracts of *Xylopia aethiopica* and *Monodora myristica* Seeds on Lipid Profile and Haematological Indices in Rats Exposed to Cyanide

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**ABSTRACT:** The purpose of this study was to determine combined effect of *Xylopia aethiopica* seed (Xa) and *Monodora myristica* seed extracts (Mm) on haematological parameters {packed cell volume (PCV), haemoglobin (Hb), red blood cell count (RBC) and white blood count (WBC)} and lipid profile {Total cholesterol (TC), triglycerides (TG), high-density lipoproteins (HDL) and low-density lipoproteins (LDL)} in cyanide exposed rats. The study was conducted using 32 male rats weighing between 120 to 150 g. The rats were divided into 8 groups of 4 rats in each group as follows: Group 1: (control), Group 2: cyanide control (exposed to cyanide only), Group 3: given Xa only, Group 4: given Mm only, Group 5: Xa+ Mm mixture only, Group 6: cyanide + Xa, Group 7: cyanide + Mm and Group 8: cyanide plus (Xa+Mm). The rats in Groups 3-8 were given the spice extracts 60mg (Xa, Mm and Xa+Mm mixture) at 1ml/kg three times per week, and Rats in Groups 2, 6, 7 and 8 received CN in form of NaCN solution at concentration of 9.0 mg/kg in the drinking tap water every day for 4 weeks. The results showed that the haematological parameters (PCV, HB, RBC and WBC) was significantly (p<0.05) increased in all the Groups treated with the Xa and Mm extracts (Groups 6, 7 and 8) when compared with the untreated Group 2. However there was no significant difference in the haematological parameters between the groups given the mixture of the two plant extracts Group 8 (Xa+Mm) and those given the two extracts separately Group 6 and 7. Results from the lipid profile indicated a significant decrease in TC, LDL and TG in all the cyanide exposed rats treated with the extracts (Group 6, 7 and 8) when compared with the untreated Group 2. However a significantly lower TC, LDL and TG was indicated in Group 8 rats given the mixture when compared with Group 6 and 7 given Xa and Mm separately. In conclusion, the result indicates that although both extracts are able to improve the haematological and lipid profile parameters in cyanide exposed rats, the combined extracts (Xa+Mm) gave better results in the lipid profile compared with the individual plant extracts in cyanide exposed rats.

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Cyanide is among the most potent cytotoxic poisons known to humans and animals (Mathangi and Namasiyavayam, 2000). It occurs naturally and has been detected in surface water (WHO, 2004). Naturally cyanide is found in some plant species such as cassava, sorghum, bamboo etc. as cyanogenic glycosides (ATSDR, 2006). It is also found in air (atmosphere) as hydrogen cyanide where it is released into the atmosphere from burning, volcanoes, natural biogenic processes from plant, bacteria and fungi (Okafor, 2000). A rise in blood cyanide level has also been observed in smoke inhalation injury and death. Studies have shown that chronic cyanide ingestion can cause impaired body growth, neurological and thyroid disturbances as well as some pathologic effects on different tissues (Tulsawani et al., 2005). Several studies have shown that cyanide exposure causes an increase in the production of free radicals thereby increasing oxidative stress. (Okolie and Osagie, 2000).

*Monodora myristica* (Africa nutmeg) belong to the family Annonaceae. The common names are calabash nutmeg, ehuru, arilo, Jamaica nutmeg etc (Burkill 1985). *M. myristica* Gaertn is perennial tree growing in the tropical rainforest in Liberia Angola, Nigeria, Cameroon, Ghana, Uganda and West Kenya (Weiss, 1985). It is a wild plant among the most used as food and drug. Studies on *M. myristica* have reported the leaves contain β-caryophyllene, α-humulene and α-pinene, however studies have also shown that α-phellandrene, α-pinene, myrcene, limonene and pinene are the major compound found as the essential oil in the seed (Fournier et al., 1999).

*M. myristica* spice has been shown to possess good antioxidant properties due to the presence of some flavonoids and phenols in its seeds. (Akinwumi and Oyedapo 2013; Uheghu et al., 2011; Ekeanyanwu and Etienajirhevwe, 2012).

Fruits of *Xylopia aethiopica* popularly called African pepper in West Africa, has different biological
activities including analgesic, vasorelaxant, and anti-inflammatory effects in rodents (Ameyaw, et al., 2014). The fruit of *X. aethiopica* contains kaurenoic and xylopic acid (XA) which is kauranes, a class of diterpenes. *X. aethiopica* extract contains an antioxidant activity and it also increases the antioxidant defense in rats subjected to oxidative stress radiation (Karioti et al., 2004).

Studies indicate that when drugs or plants are ingested orally they alter hematological indices of an organism either positively or negative. (Owoyele et al., 2011, Ajagbonna et al., 1999) Studies on the haematological parameters will supply information on inflammation, necrosis as well as the presence of stress. (Melillo, 2007; Ekeanyanwu and Etiemajirhevwen, 2012).

Lipid distribution in the body is an indication of one’s health status. Cholesterol, triglycerides, and high-density lipoproteins are important constituents of the lipid profile in the human body. Cholesterol is essential for the normal functioning of all animal cells and is a fundamental constituent of cell membranes. It also functions, as precursors of different substances in the body, such as adrenal, gonadal steroid hormones and bile acids used in the emulsification of fats. Triglycerides are fatty acid esters of glycerol and they represent the main lipid component of dietary fat and fat deposits in animals. While high density lipoprotein, mostly referred to as “the good cholesterol”, functions in the amelioration of excess of fatty acids in the blood, by carrying them to the liver to be metabolized. (Mard-Soltani, et al., 2012).

In most part of Nigeria were *M. myristica* and *X. aethiopica* are consumed as food, the seed from both plants extracts are usually used together hence the objective of this research is to investigate the combined effects of the aqueous extracts of these two plant on the haematological indices and lipid profile in albino rats.

**MATERIALS AND METHODS**

**Sample Collection:** The spices *X. aethiopica* and *M. myristica* were purchased from Abraka main market, Delta State. The plants spices were identified by a taxonomist at the Department of Botany, Delta State University, Abraka.

**Experimental Animals:** 32 albino rats weighing between 150g and 180g were obtained from the animal house Delta State University, Abraka. The rats were fed on growers mash and were given water ad libitum. The rats were housed in cages constructed of aluminum sheet and wire gauze under control condition of 12h light/ 12 dark cycle.

**Experimental Design:** A total of thirty two (32) rats were used for the study. The rats were divided into 8 groups of 4 rats per group as follows: Group 1: normal control: rats in this group received tap water daily throughout the experiment. Group 2: cyanide control; Groups 3 and 6; Rats in this group received 60mg/kg /0.1mlXE three times per week for 4 weeks. Group 4 and 7: Rats in this group received 60mg/kg/0.1ml Mm three times per week for 4 weeks. Group 5: Rats received 30mg/kg /0.05ml Xa and 30mg/kg/0.05Mm Group 6: Rats in this group received CN +Xa mixture three times per week for 4 weeks. Group 7: Rats in this group received CN + Mm mixture three times per week for 4 weeks.

The oral administrations of the *X.aethiopica* and *M.myristica* extract were carried by gavage, three times per week for 4 weeks. Rats in Groups 2, 6, 7 and 8 received CN in form of NaCN solution at concentration of 9.0 mg/kg in the drinking tap water every day for 4 weeks. On the last day the rats were allowed to fast overnight and sacrificed by cervical decapitation.

**Fig 1:** Picture of *X. aethiopica* whole pods

**Fig 2:** Picture of *M. myristica* seeds
The purpose of this study was to determine combined effect of Xylopia aethiopica seed extract (Xa) and Monodora myristica seed extract (Mm) on haematological and lipid profile parameters including total cholesterol, HDL, LDL, triglycerides and haemoglobin. The study aimed to determine the effect of cyanide on rat blood cells and also the effectiveness of the combined extract of Xa and Mm in rats exposed to cyanide. The study was conducted by exposing 10 rats to cyanide and then treating them with aqueous extract of Xa and Mm. The results showed that the combined extract was more effective in reducing the effect of cyanide on blood cells compared to the individual extracts. The study also demonstrated that the combined extract had a higher oxygen carrying capacity compared to the individual extracts.

### RESULTS AND DISCUSSION

The purpose of this study was to determine combined effect of Xylopia aethiopica seed (Xa) and Monodora myristica seed (Mm) on haematological and lipid profile parameters. The study aimed to determine the effect of cyanide on rat blood cells and also the effectiveness of the combined extract of Xa and Mm in rats exposed to cyanide. The study was conducted by exposing 10 rats to cyanide and then treating them with aqueous extract of Xa and Mm. The results showed that the combined extract was more effective in reducing the effect of cyanide on blood cells compared to the individual extracts. The study also demonstrated that the combined extract had a higher oxygen carrying capacity compared to the individual extracts.

### Table 1: The combined effects of aqueous extract of Xylopia aethiopica (Xa) and Monodora myristica (Mm) on haematological parameters in rats exposed to cyanide toxicity

| Groups | PCV (%) | RBC (x10^6/L) | WBC (x10^3/L) | Hb (mg/dl) |
|--------|---------|---------------|---------------|------------|
| 1 control | 30.00±9.83a | 2.30±1.02a | 10.67±0.42a | 11.80±1.13a |
| 2 CN control | 23.90±2.42b | 2.65±0.02b | 17.74±0.08b | 5.42±1.98b |
| 3 Xa | 35.64±1.94c | 10.50±1.73c | 11.40±0.65c | 12.21±1.53c |
| 4 Mm | 37.83±4.23c | 12.15±0.17c | 11.92±0.27c | 13.33±0.93c |
| 5 Xa+Mm | 38.17±4.73c | 14.00±1.15c | 12.52±0.37c | 13.77±1.99c |
| 6 CN + Xa | 29.20±4.73c | 6.61±0.46c | 6.10±0.12c | 7.29±1.44c |
| 7 CN + Mm | 32.72±4.31c | 8.75±0.29c | 6.88±1.02c | 8.23±5.64c |
| 8 CN +(Xa+Mm) | 33.00±5.55c | 9.75±0.29c | 7.66±0.62c | 10.48±2.82c |

Each value represents mean ± SD. n = 4 in each group. Values not sharing a common superscript letter in the same column differ significantly at (p < 0.05).

### Table 2: The combined effects of aqueous extract of Xylopia aethiopica (Xa) and Monodora myristica (Mm) on the lipid profile of rats exposed to cyanide toxicity

| Groups | Total cholesterol | HDL | LDL | Triglycerol |
|--------|-------------------|-----|-----|------------|
| 1 control | 162.38±3.49a | 86.23±8.94a | 33.87±2.80a | 211.38±12.79a |
| 2 CN control | 181.26±7.21b | 41.30±4.20b | 81.39±2.52b | 292.57±17.36b |
| 3 Xa | 167.61±18.54a | 91.38±1.10a | 36.93±5.29a | 196.48±8.09a |
| 4 Mm | 156.47±14.47a | 89.23±1.49a | 26.93±3.55a | 201.56±10.82a |
| 5 Xa+Mm | 149.54±10.02a | 92.32±1.49a | 17.85±11.7c | 198.34±10.84a |
| 6 CN + Xa | 152.35±17.02b | 68.95±2.60b | 38.33±1.26b | 253.7±22.73b |
| 7 CN + Mm | 154.39±18.39c | 70.53±3.52c | 39.76±1.79d | 255.2±10.45c |
| 8 CN +(Xa+Mm) | 159.29±15.89c | 79.52±4.86c | 35.20±3.74c | 207.88±7.11c |

Each value represents mean ± SD. n = 4 in each group. Values not sharing a common superscript letter in the same column differ significantly at (p < 0.05).

The two major functions of the red and white blood cells are carriage of oxygen and defense against microbial attack respectively. The present study indicates that the RBC and WBC level were significantly (p < 0.05) decreased in all rats exposed to cyanide as compared to the groups not exposed to cyanide. This indicates that cyanide decreases the oxygen carrying capacity of the red blood cells and reduces the ability of the white blood cells to protect the organism against microbial attack. (Okolie and Asonye, 2004). However when comparing the results amongst the cyanide exposed rats, those treated with the extracts in singular forms (Xa and Mm) and combined forms (Xa + Mm) (group 6, 7, and 8) showed a significant decrease in RBC and WBC when compared with Group 2 not treated (cyanide control) In
addition there was no significant difference when comparing those given the combined extracts Group 8 (Xa+Mm) with Group 6 (XA) and Group 7 (Mm). Phytochemical screening indicates that M.myristica and X. aethiopica extract are good antioxidant (Nwozo et al., 2015; Nguefacket al., 2004). This indicates that these plants are able to reduce the damage resulting from oxidative stress induced by cyanide (Nwozo et al., 2015; Karioti et al., 2004).

Lipid distribution in the body is an indication of its health status. Cholesterol, triglycerides, and high-density lipoproteins are important constituents of the lipid profile in the human body. Cholesterol is an unsaturated alcohol belonging to the sterane family. It is essential for the normal functioning of all animal cells and is a fundamental constituent of cell membranes. It also functions, as precursors of different substances in the body, such as adrenal, gonadal steroid hormones and bile acids used in the emulsification of fats. Cholesterol serves as a component of the cell membrane. (Hanukoglu, 1992) and is known, for its association in cardiovascular risk factors with lipoprotein in the blood. Determination of total cholesterol is important in the evaluation of metabolic conditions, such as hypercholesterolemia.

In this present study there was a significant increase (P>0.05) in TC, LDL and TG levels in the rats exposed to cyanide alone (Group 2) when compared with the control not exposed to cyanide. However a concomitant decrease was indicated in the TC, LDL and TG in rats exposed to cyanide and treated with Xa (group 6) and Mn (Group 7). This is in agreement with the works of Nwozo, et al., (2011) which they reported that Mn extract is able to improve the lipid profile in hypercholesteremic rats and Nwafor, 2013 who observed that X. aethiopica had a dose dependent effect on the TC, LDL and TG levels in rats. However a significantly lower TC, LDL and TG was indicated in Group 8 rats given the mixture when compared with Group 6 and 7 given Xa and Mn separately.

Conclusion: In conclusion, the result indicates that although the individual extracts are able to improve the haematological and lipid profile parameters in cyanide exposed rats, the combined extracts (X.aethiopica and M.myristica) gave better results particularly in the lipid profile of rats exposed to cyanide compared with the individual plant extracts given separately. Therefore a combined intake of X.aethiopica and M.myristica is better able to prevent anemia, coronary heart diseases and other diseases associated with high total cholesterol and triglycerides.

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