The Therapeutic Impact of The Ethanolic Leaf Extract of *Vernonia Amygdalina* on Castor Oil Induced Diarrhoea in Wistar Albino Rats

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**ABSTRACT**

The effect of the ethanolic leaf extract of *Vernonia amygdalina* (bitter leaf) on castor oil induced diarrhoea in waster albino rats was analysed using loperamide 0.006mg/100g body weight as a reference standard. The result showed that *Vernonia amygdalina* exhibited a dose dependent, significant (p<0.05) anti-diarrhoeal activity against the castor oil induced diarrhea. The mean weight of faeces for the positive control (loperamide), the negative control (normal saline), 20mg/100g body weight and 40mg/100g body weight of the leaf extract were: 1.10 ± 0.12, 3.08±0.25, 2.45 ± 0.25, and 2.12 ± 0.28, respectively. The mean number of faecal drops was: 1.0 ±1.14, 6.0±2.0, 3.25±1.64, and 2.50±0.54 respectively. The percentage inhibitions were: 64.28%, for loperamide, 20.45% for the extract at 20mg/100g body weight and 31.16%, at 40mg/100g body weight. This shows that the ethanolic leaf extract of *Vernonia amygdalina* may contain pharmacologically active substance(s) with anti-diarrhoeal efficacy.

**Keywords:** Therapeutic, Impact, Induce, Diarrhoea, Castor oil, *Vernonia amygdalina*
INTRODUCTION

*Vernonia amygdalina* (bitter leaf) is a perennial herb with bark light grey or brown, branches brittle, leaves lanceolate to oblong and up to 28 x 10cm but usually about 10-15 x 4-5cm margin entire or finely toothed petiole usually very short but may be 1-2cm long. Flower head is thistle-like, small, creamy white about 10cm long. It occurs widely in most countries of tropical Africa, It is commonly grown as a vegetable in Benin, Nigeria, Cameroon, Gabon and democratic republic of Congo and their neighboring countries although in a lesser extent [1].It is a member of the Asteraceae family commonly used in traditional medicines. The leaf decoctions are used to treat diabetes, fever, malaria, diarrhoea, dysentery, hepatitis and cough. It is also used as medicine for scabies, headaches, stomach and joint pains associated with AIDS, gingiveties and toothache due to its proven anti-malarial activity [2][3][4][5].It is a highly appreciated vegetable in west and central Africa and can be consumed in various dishes. The leaves are browsed by goats. The dry stems and branches provide fuel. The young stems are used as tooth picks or chewing sticks. The plant is sometimes grown as a hedge. The branches are used as stakes to line fields.

*Vernonia amygdalina* leaf contains protein, fat, carbohydrate, crude fiber, energy and minerals such as calcium, phosphorus, iron and ascorbic acid, its leaf extract has been found to reduce the rate of gastric emptying in rats, these effects of *Vernonia amygdalina* may be important in influencing the bioavailability of drugs taken immediately or after a meal containing this vegetable [6][7].Chimpanzees also ingest the bitter pith of *Vernonia amygdalina* for the control of intestinal nematode infections [8]. The bitter sesquiterpene lactons components of *Vernonia amygdalina* extract may help suppress or kill cancerous cells [9]. It strengthens the immune system through many cytokinines regulation [10]. It’s leaves has high dietary fiber. High levels of dietary fiber in leafy vegetables are advantages for their active role in the regulation of intestinal transit, increasing dietary bulk and increasing faeces consistency due to their ability to absorb water [11]. Due to low level of crude fat in this vegetable leaf, its consumption in a large amount is a good dietary habit and may be recommended to individuals suffering from overweight or obesity.

Diarrhoea may be defined as rapid movement of water, nutritive elements and electrolytes producing abnormal frequent evacuation of watery stools. Scientists usually define diarrhoea as excessive fluid weight, with 200g per day representing the upper limit of normal stool water for healthy adults. Since stool weight is largely determined by stool water, most cases of diarrhoea result from disorders of intestinal water and electrolyte transport. The daily challenge of the gut is to extract water, minerals and nutrients from the luminal contents leaving behind a manageable pool of fluid for proper expulsion of waste material via the process of defecation. Normally about eight to nine litres of fluid enter the small intestine daily from exogenous and endogenous source. Net absorption of the water occurs in the small intestine in response to osmotic gradient that result from the uptake, secretion of ions and the absorption of nutrients (mainly sugars
and amino acids) with only about 1 to 1.5 liters crossing the ileocecal valve. The colon then extracts most of the remaining fluids leaving about 100ml of the fecal water daily.

Under normal circumstances, these quantities are well within the range of the total absorptive capacity of the small bowel (about 16 liters) and colon (4 to 5 liters). Pathogens and drugs can alter these processes resulting in changes in either secretion or absorption of fluid by the intestinal epithelium. Altered motility also contributes in a general way to this process, as the extent of absorption parallels transit time.

Loperamide, is a piperidine butyramide derivative with \( \mu \)-receptor activity, it is an orally active antidiarrhoeal agent. It penetrates the central nervous system poorly and increases small intestinal and mouth-to-cecum transit times. It acts principally via peripheral \( \mu \)-opioid [12]. It also increases anal sphincter tone, an effect that may be of therapeutic value in some patients who suffer from anal incontinence. In addition it has anti-secretory activity against cholera toxin and some forms of \( E. \ coli \) toxins, presumably by acting on gastrointestinal-linked receptors and countering the increase in cellular cyclic amp generated in response to the toxin.

Castor oil also known as \( \text{Ricinus communis} \), induces diarrhoea by hyper secretory responses which increases peristaltic activity and alters the permeability of the intestinal mucosa to water and electrolytes [13] The liberation of ricinoleic acid from castor oil by intestinal lipases results in irritation and inflammation of the prostangladin which stimulates motility and secretion [14]

Diarrhoea can be described as the bowels inability to cope with fatty foods which causes an imbalance that produces negative toxins. Amongst the things that creates this imbalance are; ingesting a poisoned substance(s) and/or other harmful bacteria, sudden and extreme climate changes, as a by-product of a disorder afflicting the vital organs i.e. hearts, lungs etc. Also stress, worry and anxiety can also trigger diarrhoea. In order to flush away the negative toxins, the body evacuates the bowels frequently and indeed sometimes violently depending on the strength of the attack and the manner in which it was brought on. And because the body is unwell and the digestive system is not working properly, these evacuations came out as loose and runny stools, sometimes streaked with blood and other mucous matter. Despite immense technological advancement in modern medicine, many people in developing countries still rely on the healing properties of medicinal plants for their daily health care needs.
MATERIALS AND METHOD

*Vernonia amygdalina* leaves were collected locally from a residential home in Amawom, Ikwuano Local Government, Abia State, Nigeria

Fresh leaves collected were thoroughly washed and dried under shade at room temperature 26 - 30°C, for 2 weeks after which it was grinded to a uniform powder. The ethanol extract was prepared and allowed to dry under ambient temperature for the evaporation of the ethanol used.

The animals were acclimatized for 14 days under standard laboratory condition. They were housed in polypropylene cages under 12 hours light/dark cycle. The animals were fed with growers’ marsh and water ad libitum. Ethanolic leaf extract of *Vernonia amygdalina* (ELEVA), loperamide, castor oil and normal saline were all administered orally.

A total of 16 rats of either sex with body weight of (150g-200g) were fasted for 18hours and divided randomly into four groups of four animals each.

Group I – Negative control (1 ml of normal saline)
Group II – Positive control (Loperamide 0.006mg/100g bw)
Group III – *Vernonia amygdalina* leaves extract (Low dose, 20mg/100g bw)
Group IV – *Vernonia amygdalina* leaves extract (High dose, 40mg/100g bw)

After 60 minutes of treatment, the animals of each group received 1ml of castor oil orally and were observed for consistency of faecal material, after which, the animals were placed in separate metabolic cages with filter paper placed under the cages which was changed every hour. The severity of diarrhoeal dropping excreted were recorded and compared with the negative control group which was considered to be 100%. Anti-diarrhoeal activity was determined in terms of percentage of protection.

RESULTS

The *Vernonia amygdalina* ethanolic leaf extract exhibited dose dependent significant antidiarrhoeal activity against castor oil induced diarrhoea in wistar albino rats. The extract significantly delayed
Table 1: Effect of the ethanolic leaf extract of *Vernonia amygdalina* (*ELEVA*) on castor oil induced diarrhoea in Wistar albino rats

<table>
<thead>
<tr>
<th>GRPS</th>
<th>Treatment</th>
<th>Dose mg/100g body weights</th>
<th>Mean number of faecal drops ± SEM after 4 hours</th>
<th>Mean weight of faeces (g) ± SEM after 4 hours</th>
<th>% inhibition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negative control (normal saline)</td>
<td>1 ml</td>
<td>6.0 ± 2.0&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.08 ± 0.25&lt;sup&gt;c&lt;/sup&gt;</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Positive control (loperamide)</td>
<td>0.006mg/g</td>
<td>±1.14&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.10 ± 0.12&lt;sup&gt;b&lt;/sup&gt;</td>
<td>64.28</td>
</tr>
<tr>
<td>3</td>
<td>ELEVA</td>
<td>20mg/100g</td>
<td>3.25 ± 1.64&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.45 ± 0.25&lt;sup&gt;b&lt;/sup&gt;</td>
<td>20.45</td>
</tr>
<tr>
<td>4</td>
<td>ELEVA</td>
<td>40mg/100g</td>
<td>2.50 ± 0.54&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.12 ± 0.28&lt;sup&gt;b&lt;/sup&gt;</td>
<td>31.16</td>
</tr>
</tbody>
</table>

Figure 1: Effects of the ethanolic leaf extracts of *Vernonia amygdalina* (*ELEVA*) on mean number of wet faeces in castor oil induced diarrhoea in Wistar albino rats.
Figure 2: Effects of ethanolic leaf extracts of *Vernonia amygdalina*(ELEVA) on percentage inhibition of wet faeces in castor oil induced diarrhoea in Wistar albino rats

the onset of diarrhoea and reduced faecal droppings and mean weight of faeces when compared to the negative control group. The anti-diarrhoeal effect of 40mg/100g was found to be less potent than the reference standard drug loperamide. The result is summarized in table 1 above.

**DISCUSSION**

Diarrhoea is the frequent passage of liquid faeces and it involves both an increase in the motility of the gastrointestinal tract, along with increased secretion and decreased absorption of fluid, and thus a loss of electrolyte (particularly Na⁺) and water. Hence, many patients need antidiarrhoeal treatment to achieve increased resistance to flow (segmental concentration, decreased population and peristalsis) and increased mucosal absorption or decreased secretion.

This condition induces an increase in the permeability of the mucosal cells and changes in electrolyte transport which results in a hyper-secretory response (decreasing Na⁺ and k⁺ absorption), stimulating peristaltic activity and diarrhoea. Inhibitors of prostaglandia synthesis are known to delay diarrhoea induced with castor oil [15]. Though these mechanisms have been proposed, mechanism of action of castor oil induced diarrhoea is still not clear. In the present study, the ethanolic leaf extract of *Vernonia amygdalina* significantly inhibited castor oil induced diarrhoea. This anti diarrhoeal activity may be due to the inhibition of prostaglandin biosynthesis. This was evident from the significant delay in the onset of diarrhoea and
decrease in purging frequency (reduction of number of wet stool, weight of wet stool and severity of diarrhoea). Furthermore, it was also supported by Anti Diarrhoeal Index (ADI). The higher the ADI value the greater the effectiveness in the treatment of diarrhoea. The extract has shown a dose dependent increase in ADI value. Among the doses 40mg/100g body weight had showed a higher ADI value.

Anti- dysenteric and anti-diarrhoeal properties of medicinal plants were found to be due to tannins, alkaloids, saponins, flavonoids, sterols and/or triterpenes and reducing sugars. These phytochemical constituent has been detected in ethanolic extract of Vernonia amygdalina leaf. Hence, these constituents could be responsible for antidiarrhoeal activity of the extract.

The results show that ethanolic leaf extract of Vernonia amygdalina contains pharmacological evidence for its folklore claims as an anti diarrhoeal agent. In the present investigation, ethanolic leaf extract of Vernonia amygdalina (40mg/100g body weight) showed more potent antidiarrhoeal activity against all tested groups.

REFERENCES