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EFFICIENCY OF ALLIUM CEPA L. AQUEOUS EXTRACT IN ALLEVIATING ANAEMIA IN PHENYLHYDRAZINE INDUCED HAEMOLYTIC ANAEMIC RATS

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ABSTRACT: *Raw onions (Allium cepa L.) have been found to contain powerful medicinal (active) ingredients which could be used to treat or manage certain ailments. In this study, effort was made to investigate the effect of aqueous extract of Allium cepa L. on phenylhydrazine induced anaemic rats in order to ascertain the claims by some traditional herbalists in Nigeria of using same to treat anaemic patients. Phytochemical screening of the aqueous extract revealed the presence of tannins, saponins, oxalates and cyanogenic glycosides. Sixteen (16) wistar rats were divided into 4 treatment groups and maintained for fourteen (14) days. One group (normal control) received normal diet only. The second group (anaemia control) was induced with anaemia using phenylhydrazine as haemolytic agent. The group was fed with normal diet. The third group (anaemic test) was induced with anaemia using phenylhydrazine as haemolytic agent. The group also received aqueous extract and normal diet. The fourth group (normal test) received the aqueous extract and normal diet only. The aqueous extract was given through gastric intubation (orally). Induction of anaemia was done by intraperitoneal injection of 125mg/kg phenylhydrazine. The body weights (BWTs) of the rats were monitored throughout the period. After 14 days, the blood samples were taken and used to determine the Packed Cell Volume (PCV) and the haemoglobin (HB) level. The findings revealed that the administration of the aqueous extract significantly affect the HB levels of the rats, as well as their PCV. It is suggested that the use of aqueous extracts of Allium cepa L. by traditional herbalists in Nigeria to treat anaemic patients appears to be justified.*

KEYWORDS: Onion, Anaemia, Wistar rats, Haemoglobin, Packed Cell Volume.

INTRODUCTION

Herbs are known for many therapeutic properties. Some are used to stimulate the body's immune system, help normalize the body functions, and raise the energy level of the body. Others are said to aid digestion, settle nerves and serve as laxatives Awake (2003). Important drugs or medicines are still being extracted from medicinal plants. Authors estimate that a quarter of all the modern-day pharmaceuticals that people rely on started wholly or in part as chemicals that occur in plants. Works on the effect and use of medicinal plants in the treatment of sickle cell anaemia had been documented previously (Tofuwora *et al*., 2005).

Onions (A*llium cepa L*.) have been revered throughout time not for their culinary use, but also for their therapeutic properties. They are high in food value; very good source of vitamin C, chromium, dietary fibre, manganese, molybdenum, vitamin B6, folate, potassium and copper (Dorsch *et al.*, 1998). Onions have also been found to contain dozens of powerful medicinal (active) ingredients, including: sulfur compounds called thiosulfinates, flavonoids, phenolic

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acids, sterols, pectin, and volatile oils. But the majority of onion's known therapeutic values are attributed mainly to the sulfur compounds and flavonoids (Sharmata, *et al*., 2001).

The National Cancer Institute (NCI) has reported that the antioxidants contained in onion help to block cancer and appear to lower cholesterol and triglyceride levels, as well as lower blood pressure. Traditionally, some herbal practitioners in Nigeria also admit that they use onion to treat anaemic and asthmatic patients (Tofuwora *et al.*, 2005). Animal studies have shown that the active ingredients in onion inhibit inflammatory compounds associated with inducing asthma. Onions have also been used in the treatment of diabetes; this has been supported with animal studies that onion reduces elevated blood sugar levels (Mark, 2005).

The present work therefore studied the effects of aqueous extract of A*llium cepa L*. on phenylhydrazine induced anaemic rats, in order to ascertain the claims by some traditional herbal practitioners in Nigeria of using same to treat or manage anaemic patients.

MATERIALS AND METHODS

Fresh red onions (A*llium cepa L*.) were purchased from terminus market at Jos, Nigeria. The experimental animals (adult male and female rats –wistar strain) were obtained from animal house of University of Jos, Nigeria. Processing of the onions to obtain aqueous extract was performed as follows: The dry outer covering of two fresh medium sized raw A*llium cepa L*.; 100g each were removed and the naked bulbs washed in tap water before being chopped into smaller pieces. These pieces were blended in 100cm^3 of distilled water using electric blender, to obtain slurry (solution). This was sieved through a mesh (No. 250) to get aqueous extract. The derived aqueous extract was used for preliminary phytochemical screening following the standard procedures of Trease and Evan, (1984) and that of Sofowora, (1986). Also, the extract was fed to the experimental animals to determine their effects as explained below.

Sixteen (16) adult wistar rats (male and female) were housed in cages with wire gauge; fed with ECWA growers mash and water on a daily basis. The body weights (BWTs) of the rats were monitored throughout the period of the experimentation on alternate days. The rats were divided into four (4) groups. The groups were treated as follows:

Group I (Normal Control): The rats in this group were fed with normal diet, without aqueous extract treatment and chemical induction of anaemia.

Group II (Anaemia Control): Here, anaemia was induced in the wistar rats; using phenylhydrazine as haemolytic agent. They were fed with normal diet but not treated with aqueous extract. Thus, they were anaemic wistar rats that served as positive (major) control to the anaemic test rats.

Group III (Anaemic Test): Here, anaemia was induced in the wistar rats; using phenylhydrazine as haemolytic agent. They were treated with aqueous extract and fed with normal diet.

Group IV (Normal Test): These were non-anaemic rats, treated with the aqueous extract and fed with normal diet. Thus, they were non-anaemic wistar rats that served as internal control to the anaemic test rats.

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The administration of the aqueous extract of *Allium cepa L*. was done by addition of the extract to their source of drinking water. Induction of anaemia was done by intraperitoneal injection of 125mg/kg phenylhydrazine following the method of Luangaram *et al*., (1999). The rats were maintained and monitored for fourteen (14) days after the induction of anaemia. At the end of the experimental period, the blood samples were obtained by cardiac puncture using 5ml syringe and needle and placed into EDTA blood collection bottles. This was used to measure the Packed Cell Volume (PCV) and the haemoglobin (HB) level using the steps of (Stuart, 1993).

RESULTS

Table 1: Phytochemical Screening of Aqueous Extract of *Allium cepa L*.

Phytochemicals	Cardiac glycosides	Saponin	Terpenes & Steroids	Resins	Flavonoids	Alkanoids	Tanins	Balsam	Volatile oil	Phenols
Result	+	+	+	+	+	+	+	-	+	+

Key: + = Present ; - = Absent

Table 1 shows the presence of cardiac glycosides, saponin, terpenes & steroids, resins, flavonoids, alkaloids, tannins, volatile oil and phenols in the aqueous extracts of *Allium cepa L*. studied, while balsam was absent.

Table 2: Body Weights (BWTs) for Control and Test Wistar Rats (in g)

Days	Groups			
	I	II	III	IV
	Normal Control	Anaemic Control	Anaemic Test	Normal Test
0	157 ± 0.01	158 ± 0.04	156 ± 0.08	157 ± 0.09
6	159 ± 0.01	151 ± 0.06	151 ± 0.02	160 ± 0.04
9	160 ± 0.03	148 ± 0.08	151 ± 0.01	163 ± 0.05
12	160 ± 0.02	143 ± 0.02	153 ± 0.03	164 ± 0.03
14	161 ± 0.03	141 ± 0.02	154 ± 0.01	166 ± 0.05

Results are means ± standard deviation of four determinations (n = 4)

Table 2 shows BWTs values in grams (g). Here, the normal control wistar rats slightly gained weight over the two (2) weeks period of experimentation, while the anaemic control wistar rats progressively lost weight over the same period of time. The anaemic test wistar rats slightly recovered lost weights over the 2 weeks period, while the normal test wistar rats progressively gained weight over the same period of time. The gain in body weight by normal test and anaemic test wistar rats were significant.

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Table 3: Packed Cell Volume for Control and Test Wistar Rats (%)

Days	Groups			
	I	II	III	IV
	Normal Control	Anaemic Control	Anaemic Test	Normal Test
6	41 ± 0.03	32 ± 0.06	32 ± 0.07	42 ± 0.05
9	42 ± 0.01	26 ± 0.07	36 ± 0.09	45 ± 0.09
12	41 ± 0.01	24 ± 0.02	37 ± 0.03	47 ± 0.04
14	41 ± 0.02	21 ± 0.02	40 ± 0.02	49 ± 0.06

Results are means ± standard deviation of four determinations (n = 4)

Table 3 shows PCV values presented in percentages (%). Here, there was no significant change in PCV of normal control wistar rats over the 2 weeks period of experimentation, while there was a significant reduction in PCV of the anaemic control wistar rats in the first 6 days, progressively reducing over the remaining period of experimentation. The increase in PCV of the normal test and anaemic test compared with the normal control and anaemic control respectively were significant on day 14.

Table 4: Haemoglobin (HB) Level for Control and Test Wistar Rats (in g/dl)

Days	Groups			
	I	II	III	IV
	Normal Control	Anaemic Control	Anaemic Test	Normal Test
6	18.25 ± 0.02	14.30 ± 0.06	14.30 ± 0.04	18.53 ± 0.02
9	18.44 ± 0.02	12.68 ± 0.02	16.33 ± 0.07	18.86 ± 0.08
12	18.25 ± 0.01	11.44 ± 0.02	17.28 ± 0.05	20.12 ± 0.01
14	18.25 ± 0.01	11.23 ± 0.01	18.54 ± 0.07	20.65 ± 0.04

Results are means ± standard deviation of four determinations (n = 4)

Table 4 shows HB level values presented in grams per deciliter (g/dl). Here, similar results were obtained for HB level as compared to PCV. There was no significant change in HB level of normal control wistar rats over the 2 weeks period of experimentation, while there was a significant reduction in HB level of the anaemic control wistar rats in the first 6 days, progressively reducing over the remaining period of experimentation. The anaemic test wistar rats had a spontaneous recovery from day 9 upwards, while there was a significant increase in HB level of the normal test wistar rats over the same period of time. The increase in HB level of the normal test and anaemic test compared with the normal control and anaemic control respectively were significant on day 14.

DISCUSSION

The administration of phenylhydrazine (PHZ) at 125mg/kg, induced anaemia in the wistar rats studied. Anaemia manifested in 6 days, indicated by reduced Packed Cell Volume (PCV) and Haemoglobin (HB) levels (tables 3 and 4 respectively). This is in agreement with studies conducted by Luangaram *et al*., (1999) using the same substrate (PHZ) for the induction of anaemia. The reduction in body weight in the phenylhydrazine induced anaemic rats was consistent, with no physiological function of blood. The administration of aqueous extracts of onions to both anaemic and non-anaemic wistar rats affected the PCV and HB levels of the rats under investigation. It was noticed that there was spontaneous recovery from phenylhydrazine

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induced anaemia, this was indicated by the results of PVC (table 3) and HB levels (table 4). The gain in body weight by anaemic rats fed on aqueous extracts of onions showed that the aqueous extract had a positive effect in alleviating anaemia; this was supported by results of tables 3 and 4. The 125mg/kg of PHZ that was administered induced haemolytic anaemia. This was resulting from an extracorporeal change. Since the effect was not on the bone marrow, there was a significant increase in the production of new red blood cells (erythropoiesis) on administration of the aqueous extracts.

CONCLUSION

Based on the results of this work, the aqueous extracts of onions investigated had a positive effect on phenylhydrazine induced anaemic wistar rats. The use of aqueous extracts of *Allium cepa L*. by traditional herbal practitioners in Nigeria to treat or manage anaemic patients appears to be justified. However, there is need for further study to be conducted on the mode of action of the active ingredients in the aqueous extracts of *Allium cepa L*. on anaemia.

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