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Original Article

The Effect of Garlic Extract (Allium Sativum) on the Blood-Sugar Level of Albino Wistar Rats

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ABSTRACT

Background: The word "garlic" comes from old English garleac, meaning "spearleek". It consists of numerous "bulb lets" or individual cloves grouped together and enclosed in a thin white skin. It is scientifically known as Allium sativum and belongs to the family liliacese (liliiocese). The study was aimed at investigating the efficacy of garlic extracts on the blood sugar level of wistar albino rats. The aim of this experiment was to study the efficacy of garlic extracts on the blood sugar level of wistar albino rats. **Materials & Methods:** Twenty-eight albino wistar rats were used for this investigation to determine the efficacy of an aqueous extract of raw garlic in controlling blood-sugar level. The raw extract of garlic (Allium sativum) was administered daily to the rats orally for 28days. The rats weighed between 200- 375g.The serum levels of glucose were measured. **Results & Discussions**: When the rats were treated with a low dose (10% and 50%) of raw aqueous extract of garlic, no significant changes in the serum glucose levels were observed compared with the control group. When the rats were treated with the raw garlic, glucose levels were significantly affected (Like a case that dropped from 102mg/dl to 75mg/dl resulting in hypoglycaemia). Raw garlic had a profound effect of reducing the glucose level in the blood and also led to marked weight loss (in one case, from 175g to 150g) as well as appreciable hair loss. **Conclusion**: Raw garlic extract apart from reducing blood-sugar level and inducing weight loss in rats.

Keywords: Garlic, Blood Sugar, Wistar Rats, Hypoglycaemia,

1. INTRODUCTION

The word "garlic" comes from old English garleac, meaning "spearleek". It consists of numerous "bulb lets" or individual cloves grouped together and enclosed in a thin white skin. White flowers are found in groups at the end of the stalk that arises directly from the bulb. It is cultivated throughout the world- planted in Feb/March, harvested in Aug/Sept. (Amy Bigus, Deanna Massengill, and Christy Walker). It is among the earliest known medicinal plants and comprises of some 700species.[1]

It is scientifically known as Allium sativum and belongs to the family liliacese (liliiocese). Its distinctive pungent tendencies are derived from the naturally occurring sulphur containing compounds present in it. Garlic is an ancient

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plant with a fascinating history. Its usage date back to over 6,000years. It's a native to Central Asia, and has long been a staple in the Mediterranean region as well as a frequent seasoning in Asia, Africa, and Europe. It's not by chance that garlic is a native to Central Asia, the region where people live the longest, and the incidence of cancer is the lowest known.[1]

Greeks regarded garlic as source of physical strength, and every athlete was given a raw clove of garlic before each competition in the Olympic Games, perhaps to make them run faster. Egyptians worshipped garlic and placed clay models of garlic bulbs in the tomb of Tutankhamen perhaps to ward off dangers on his way to the other world. [1]

Folklore holds that garlic repelled vampires, protected against the evil eye, and warded off jealous nymphs said to terrorize pregnant women and engaged maidens. The Jews love garlic and when they were deprived of it in the wilderness, they grumbled; "the rabble with them began to crave other food, and again the Israelites started wailing and said 'if only we had meet to eat. We remember the fish we ate in Egypt at no cost- also cucumbers, melons, leeks, onions and garlic. But now we have lost our appetite: we never see anything but this manna (Num 11:4-6).

In Nigeria, there are some beliefs about the powers of garlic. In Eastern Nigeria, the smell of garlic is said to be offensive not only to human beings but also to evil spirits. Hence, those who wish to ward off evil spirits use it. In some part of Yoruba land, garlic is used to neutralize harmful charms. Rubbing mashed garlic on one's hand does this. As soon as one touches the charm, it becomes neutralized. "An Igbo lady recently shared her experience. According to her, she had been experiencing a strange disappearance of money from her house. Whenever she kept money in her wardrobe, she would soon discover that half the money had disappeared mysteriously, even though she was living alone. This experience had been on for some time. Then one day as she was praying, she received an inspiration to keep a bulb of peeled garlic in her wardrobe. This she did and she even recommended it to others and it has worked in all the cases. All these show that indeed garlic was seen from earliest times to be a mysterious plant. [1]

Aim of the Study

The aim of this experiment is to study the efficacy of garlic extracts on the blood sugar level of wistar albino rats.

Few researchers have worked on garlic on varying parameters and reports were given. Authors. [2-7]

Fig 1: Garlic Bulbs

Chemical Composition of Garlic

When garlic cells are ruptured by cutting or pressing, they release an enzyme called Allinase. This enzyme chemically changes the inherent alliin into allicin, a sulphur-containing molecule, resulting in that heady, pungent garlic smell which is a mainstay in kitchens around the world. Other chemical composition of garlic includes: Ajoene- Decreases blood cell clumping released when garlic is ground, chewed or cooked and is produced by allicin condensation, Selenium- an antioxidant contained in high quantities in garlic, Saponins- also contained in garlic is known to lower blood pressure, decreasing chances of stroke. Fructans- Has been attributed to stimulate the immune system. [8]

Chemical composition of garlic for every 100grams is formed by the following constituents; Water 59g, Calories 149Kcal, Lipids 0.5g, Carbohydrates 33.07g,Fibre 2.1g, Manganese 1672mg,Potassium 401mg, Sulphur 70mg,Calcium 181mg, Phosphorus 153mg, Magnesium 25mg, Sodium 17mg, Vitamin B-6 1235mg, Vitamin C 31mg, Glutamic acid 0.805g, Argenine 0.634g, Aspartic acid 0.489g, Leucine 0.308g, Lysine 0.273g.

Nutritional Composition of Garlic

Nutritionally, fresh garlic is composed of several nutrient sources. They include the following;- carbohydrates, amino acids, fat fibre, essential oil, water, minerals and fibre. *Carbonhydrate* - 0.14%, sucrose 3.7%, starch 8.22% and dextrin as 17.69%. *Amino Acids* - Garlic contains all the essential amino acids. *Vitamins* - Garlic is reported to be rich in vitamins. [8]

Blood Glucose /Sugar Level

Blood glucose and blood sugar are interchangeable terms, and both are crucial to the health of the body. Blood sugar levels are literally the amount of glucose in the blood, sometimes called the serum glucose level. Glucose, transported via the blood stream from the intestines to body cells, is the primary source of energy for the body's cells.

Usually the amount of glucose level in the blood is expressed in millimoles per litre (mmol/l) and stays stable amongst non-diabetic people at around 4-8mmol/l. [9]

Normal blood glucose level (Homestasis) is about 90mg/100ml, which works out to 5Mm/L, as the molecular weight of glucose; C6H12O6), is about 180g/mol. The normal total amount of glucose in circulating blood is therefore about 3.3 to 7g (assuming an ordinary adult blood volume of 5litres, plausible for an average adult male). Glucose levels rise after meals for an hour or two and are usually lowest in the morning, before the first meal of the day. [9]

Blood Sugar Levels Control

High levels of glucose present in the blood over a sustained period of time end up damaging the blood vessels. Although this does not sound too serious, the list of resultant complications is. Poorly controlled blood glucose levels can increase your chances of developing diabetes complications

including nephropathy, neuropathy, retinopathy and cardiovascular diseases. [10]

Blood Sugar Level

Despite long intervals between meals or the occasional consumption of meals with a substantial carbonhydrate load, human blood glucose levels normally remain within a remarkably normal range. (From Wikipedia) A normal pre-prandial (before meal) blood glucose level will be between 4 and 7mmol/l (or btw 80mg/dl and 120mg/dl). After eating (post-prandial) levels should be less than 10mmol (or up to 140mg/dl in a non-diabetic) when tested 90minutes after a meal. When going to bed for the night, levels should be about 8mmol/l. [10]

Low blood sugar

Some people report drowsiness or impaired cognitive function several hours after meals, which they believe is related to a drop in blood sugar, or "low blood sugar".

Mechanisms which restore satisfactory blood sugar levels after hypoglycemia must be quick and effective, because of the immediate serious consequences of insufficient glucose (in the extreme, coma, less immediately dangerous, confusion or unsteadiness, amongst many other effects. This is because, at least in the short term, it is far more dangerous to have too little glucose in the blood than too much. Such hypoglycaemic episodes vary greatly between persons from time to time, both in severity and swiftness of onset.

In severe cases, prompt medical assistance is essential, as damage (to brain and other tissues) and even death will result from sufficiently low blood glucose levels. [10]

Converting Glucose Units

The standard unit for measuring blood glucose is mmol/l(same as millimolar,mM). The US is the only country in the world to use mg/dl. To convert blood glucose readings: Divide the mg/dl figure by 18(or multiply by 0.055) to get mmol/l, Multiply the mmol/l figure by 18(or divide by 0.055) to get mg/dl.

2. MATERIALS AND METHODS

Research Design: An experimental study with total of twenty-eight (28) male albino experimental rats was used for this study. The rats were put into cages with clean saw dust and fed with animal feed and clean tap water. They were allowed to acclimatize in the laboratory for a period of seven (7) days. On the 8th day, the animals were divided into three (3) groups of eight (8) experimental animals each and a control group of (4) animals. The control group (A) were given the normal meal of animal feed and clean tap water only. The other groups (B, C and D) received a diet supplemented with 10%, 50% and 100% of Allium sativum-the garlic extract. Group A was the control, Group B was given 10% of the garlic extract at 7.00am and 7.00pm for 28days, Group C was given 50% of the garlic extract at 7.00am and 7.00pm for the 28days and Group D was given the absolute garlic extract (100%) at 7.00am and 7.00pm for 28days. The garlic extract was administered orally. All the rats were weighed after the period of acclimatization before the administration of the drug and also after the administration of the drug. On the 7th day, two rats were selected from each group and blood sample was obtained through sectioning of the tail and the blood-sugar level measured with the aid of a glaucometer. Same procedure was repeated on two rats from each group on the 14th, 21st, and 28th days with their blood-sugar level also determined respectively.

Garlic Extraction Procedure

All the garlic used for this project was purchased from Choba market in the University of Port Harcourt, Rivers State, Nigeria and identified in the Department of Plant Science and Biotechnology of the University of Port Harcourt. The garlic cloves were peeled thoroughly to remove the outer skin. The extract was obtained from the raw garlic using a manual grinder and the absolute juice was derived by sieving the extract with a sieve.

The extract obtained was diluted as follows

Group	Percentage	Raw garlic	Distilled water	Number of rats
A	CONTROL RATS			4
B	10%	10ml	90ml	8
C	50%	50ml	50ml	8
D	100%	100ml	Nil	8

How the Blood-Glucose Meter was used in the experiment using albino wistar rats.

1. The tail section of the rat was cleaned using methylated spirit
2. A slight cut was made on the tail and blood to be tested was obtained from there
3. The blood was directed to the correct spot on the test strip
4. The directions as shown by the blood-glucose testing meter were followed correctly.
5. The results appeared on the screen of the testing meter and it was recorded appropriately. The time of the experiment was also noted.

3. RESULTS

The table below shows the weight of the rats before and after administration of the garlic extract solution.

Table 1: Before Garlic Administration

Group	7th day	14th day	21st day	28th day
B	125g	125g	150g	250g
	175g	200g	225g	250g
C	175g	175g	200g	225g
	225g	225g	275g	300g
D	175g	150g	150g	150g
	125g	125g	100g	100g

Table 2: After Garlic Administration

Group	7th day	14th day	21st day	28th day
B	125g	175g	175g	250g
	200g	225g	250g	250g
C	175g	200g	225g	225g
	225g	275g	300g	300g
D	150g	150g	150g	125g
	125g	100g	100g	100g

The next set of tables below show the blood-sugar level after each week of administration of the drug

Table 3: Before Garlic Administration

Group	7th (mg/dl)	day14th (mg/dl)	day21st (mg/dl)	day28th (mg/dl)	day
B	87	90	90	126	
	124	130	124	101	
C	99	96	103	111	
	93	96	99	88	
D	102	100	126	43	
	126	90	102	74	

Table 4: After Garlic Administration

Group	7th (mg/dl)	day14th (mg/dl)	day21st (mg/dl)	day28th (mg/dl)	day
B	90	100	98	126	
	124	124	101	104	
C	97	87	102	111	
	93	96	93	102	
D	102	85	50	29	
	94	74	85	50	

From the experiment, it was proved that as the concentration of the garlic extract decreases (dilution increases), as the rats were treated with pure garlic extracts (100%), 50% and 10% dilution of the extract, it was observed that the more the dilution, the lesser the effect.

Experimental Group

Group B (10% garlic extract) - The experimental animals which were given this 10% dosage of the garlic extract tend to generally experience an increase in weight. It was also noticed that their blood-sugar level either remained the same or slightly increased. Although in one case, there was a slight decrease.

Group C (50% garlic extract) - Animals in this group experienced very slight decrease in weight. Although in most cases there was increase. There were also slight changes in their blood-sugar level but their blood-sugar level also fell within the normal range.

Group D (raw 100% garlic extract)- The experimental animals in this group experienced severe weight loss. In one of the cases, the weight was reduced by almost half. Their blood-sugar level also reduced drastically resulting in hypoglycaemia.

Control Group

This group was not garlic extracts and hence experienced no weight loss. Rather they increased in weight because they just ate animal feed and drank clean water.

4. DISCUSSIONS

In this experiment, it was discovered that administration of raw garlic extract in Group D show severe weight loss and also reduced blood- sugar level. Most animals in this group seem to suffer from hypoglycaemia (low blood sugar) and in some cases decrease in blood volume.

Raw garlic has been proven to prolong clotting time. This was evidenced in one case where the rat had an injury in the mouth and this rat happens to be in the raw garlic extract category. The garlic ended up delaying the clotting time as stated above and prolonged healing. We noticed that the rat was progressively getting weaker, losing appetite and also weight. The rat eventually died of hypovolumic shock secondary to blood loss. It was also noticed that most rats in the raw extract category experienced hair loss mainly around the area of administration. This could be due to the pungent smell and pepperish effect of raw juiced garlic. It could also result from the activity of allicin in the garlic which is very active when garlic is consumed raw. A few of the animals in the 50% category also experienced hair loss. The result of this study has supports the reports of previous authors. [7-11]

5. CONCLUSION

Raw garlic extract apart from reducing blood-sugar level and inducing weight loss in rats, researches have shown that it has the tendency of destroying the mucosa lining of certain organs in the body such as the large intestine and the stomach. This is why some pharmaceutical companies are marketing garlic with reduced pungent smell.

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LIMITATIONS OF THE STUDY

This study was limited to the blood sugar parameter of the wistar rats.

RECOMMENDATION FOR FURTHER STUDY

We recommend that research be done to study the effect of garlic extract on anaemic rats as we discovered that some of our rats had reduced blood volume after the administration of the garlic.

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