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Full Length Research Paper

The effects of different treatments on the phytochemicals, proximate, and mineral contents of beniseeds (*sesamum indicum* linn)

Momoh, A.O *, Adebolu, T.T and Ogundare A.O

Department of Microbiology, Federal University of Technology, PMB 704, Akure, Ondo State, Nigeria.

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Sufficient Beniseeds were weighed and subjected to different treatments (fresh, roasted, boiled and fermented) to evaluate the effects of these treatments on the phytochemicals, proximate and mineral contents of the seeds. The qualitative phytochemical analysis shows the presence of tannin, phenol, saponin, alkaloid, phytate, oxalate, trypsin inhibitor and glycoside. Fermentation had significant effect on alkaloid, reducing its value from 11.13% in the fresh sample to 0.01% in the fermenting form by day three. Roasting had the highest significant effect on the saponin content of the seeds reducing it from 2.47% to 0.56%. Fermentation had the highest reducing effect on the anti-nutrients followed by roasting. The treatments had significant effect on the mineral content of the seeds. For instance, while boiling had reducing effect on the sodium, potassium and calcium content of the seeds, roasting had an increasing effect. Also, while boiling decreased the protein content from 21.28% in the fresh form to 17.41%, fermentation increased it to 29.93%.The results obtained in this work show that the subjection of beniseeds to different treatments has significant effect on its phytochemicals, minerals and nutrient contents of the seeds and these effects can be harnessed to make beniseeds a good nutraceutical supplement.

Keywords: Beniseeds, Phytochemical, Glycoside, Saponin, Alkaloid, Phytate, Oxalate, Trypsin inhibitor.

INTRODUCTION

Beniseeds, which serves as food in various parts of the world is known to have medicinal properties (Odugbemi, 2006). The plant belongs to the family pedaliaceae and is an annual crop that grows in tropical areas (Dutta, 2004. And Dan *et al*, 2004). The seeds are tiny, flat ovals and measuring about 3mm (Oshodi *et al.,* 2010). The plant roots and leaves are used in treating migraine, hypertension, ulcers, constipation, chicken pox and piles (Odugbemi, 2006). The fermented form of the paste have been reported to have antibacterial activity by Momoh *et al*., (2011). The Ebira people in Kogi State of Nigeria use it for the treatment of intestinal disorder, especially in children, expecting mothers and young adults. They also use it for soup after grinding it into smooth paste with grinding stone and they equally roast/fry it as snacks. The concept of improving intestinal health using cheap and effective nutraceutic agents is presently one of the avenues being exploited for use by medical sciences (Oyetayo, 2009). This research is therefore focused on the possibility of improving the nutritional content of beniseeds by subjecting it to different treatments and

*Corresponding authors E-mail: davemoh20@yahoo.com

evaluating the effects of the treatments on the anti-nutrients present in the seeds.

MATERIALS AND METHODS

Collection of Beniseeds

The beniseeds was bought at Okene central market in Kogi State of Nigeria. Its identity was confirmed in the department of Crop Science of the Federal University of Technology, Akure, Ondo State.

Subjection of the seeds to different treatments

(a) Fermentation of Beniseeds

Five hundred grammes of the seeds was soaked in 1000ml of water for 3 days and grounded into a smooth paste using thoroughly washed electrical grinding engine. It was then filtered using muslin bag. The filtrate was kept at ambient temperature (29^0C) to undergo natural fermetation and allowed to settle for 3hours before used as day zero, after 24hours as day one, after 48hours as day two and after 72hours as day three.

(b) Boiling of seeds

Two hundred grammes of the seeds were weighed into 500ml of boiling distilled water for 10minutes.

(c) Roasting/frying

Two hundred grammes of the seeds were weighed into the tray of an oven at 110^0C and kept there for 10minutes with constant stirring every minute.

(d) Fresh sample

The fresh sample was first crushed in a crucible before used.

Determination of proximate Analysis, minerals and phytochemicals of different beniseed treatment

The proximate analysis of the different treatment samples were analysed chemically according to the official methods of analysis described by the Association of Official Chemist (A.O.A.C, 2000). All analyses were carried out in triplicates. The analyses include determination of crude protein, crude fibre, ether extract, ash content, moisture content and dry matter.

Determination of minerals was by the same method (A.O.A.C, 2000). The minerals determined after confirmation of their presence are sodium, potassium, calcium, magnesium, zinc, copper, manganese, iron, and phosphorus. All analyses were carried out in triplicates.

The phytochemical analysis was carried out according to the standard methods of analysis by analytical methods committee of Royal Society of chemistry. AMC-RSC (2002) pp 222-239.

RESULTS

The results of the analyses showed that the diferrent treatments the seeds were subjected to had significant effects on its phytochemicals, proximate and mineral contents. Table 1 shows the result of the proximate analyses of the various treatments. Fermentation increased the protein content of the seeds from21.28$\pm$0.47% in the fresh sample to 29.93$\pm$0.06%. On the other hand, boiling decreased it to 17.41$\pm$0.01%. The moisture content and dry matter were lowest in the roasted sample, while the ash content was lowest in the fermented samples.

The results of the mineral content of the beniseeds subjected to different treatments are shown in table 2. There was significant difference in the results of the different treatments. The sodium content of the seeds was increased slightly by roasting from 2.62$\pm$0.03% in the fresh sample to 2.85$\pm$0.04% but fermentation by day one increased it to 3.29$\pm$0.28%. In all the minerals with significant increase in their values due to the different treatments was seen in fermented day one treatment. Also, roasting had significant effect and boiling showed significant reducing effect on the minerals. The results of the mineral analyses also showed that the seeds generally had a high content of sodium, potassium calcium, magnesium and phosphorus but low in zinc, copper, manganese and iron.

The result of the phytochemical analyses shows that roasting has a reducing effect on tannin, phenol, saponin, alkaloid, phytate and oxalate. For instance, while the value of saponin was 2.47$\pm$0.02% in the fresh sample, it reduced to 0.56$\pm$0.01% in the roasted sample. However, fermentation had the greatest reducing effect on alkaloid. The level of alkaloid reduced from 11.13$\pm$0.27% in the fresh sample to 0.01$\pm$0.00% in the fermented sample. Table 3 shows the result of the phytochemicals the different treatments the seeds were subjected to.

DISCUSSION

The results obtained in this research work showed that the different treatments the seeds were subjected to had

Table 1. Proximate analysis of different treatment of Beniseeds.

Treatment	A	B	C	D	E	F
Fresh	21.28±0.47d	13.58±0.07c	33.79±0.04e	7.89±0.05c	5.95±0.18a	93.98±0.24f
Boiled	17.41±0.01c	10.60±0.0b	27.77±0.15d	6.88±0.07a	10.58±0.17b	89.41±0.16e
Roasted	22.91±0.08d	7.46±0.05c	35.71±0.10e	4.22±0.02a	6.08±0.25b	88.45±1.04f
Fermented Day zero	21.77±0.06c	7.071±0.06a	33.06±0.06d	6.93±0.06a	12.53±0.23b	90.13±0.06e
Fermented Day one	26.88±0.08d	6.85±0.05d	32.13±0.49e	2.98±0.95a	13.43±0.44c	81.38±1.06f
Fermented Day two	28.48±0.02d	6.17±0.06b	31.13±0.83e	3.40±0.10a	14.91±0.04c	84.97±0.06f
Fermented Day three	29.93±0.06d	6.06±0.06b	32.13±0.06e	3.03±0.21a	15.33±0.07c	82.09±0.08f

Values followed by the same letter in a column are not significantly different at P = 0>0.05
Keys: A= % Protein content, B= % Crude fibre, C= % Ether extract, D= % Ash content, E= % Moisture content, F= % Dry matter.

Table 2. Mineral Content of different treatments of Beniseeds

Treat-ments	1	2	3	4	5	6	7	8	9
A	2.62±0.03g	2.84±0.03h	1.11±0.02f	0.36±0.03d	0.04±0.00b	0.1±0.00a	0.05±0.00b	0.09±0.00c	0.44±0.00e
B	1.73±0.02f	1.95±0.05g	0.76±0.04e	0.21±0.01c	0.03±0.00a	0.01±0.00a	0.04±0.00a	0.07±0.00b	0.44±0.00d
C	2.85±0.04e	3.73±0.06f	1.41±0.10d	0.41±0.03c	0.04±0.00a	0.05±0.00a	0.05±0.00a	0.20±0.00b	0.46±0.00c
D	2.55±0.05e	2.20±0.20d	1.00±0.00c	0.36±0.01b	0.04±0.00a	0.10±0.00a	0.5±0.00a	0.09±0.00a	0.44±0.00b
E	3.29±0.28e	3.94±0.14f	1.49±0.11d	0.40±0.02b	0.05±0.00a	0.01±0.00a	0.19±0.01a	0.64±0.06c	0.644±0.06c
F	2.44±0.02g	2.94±0.04h	1.07±0.06f	0.23±0.04c	0.40±0.00d	0.00±0.00a	0.02±0.00a	0.14±0.01b	0.47±0.02e
G	1.93±0.03f	2.70±0.01g	0.95±0.05e	0.17±0.04b	0.04±0.01c	0.00±0.00a	0.02±0.00a	0.47±0.02b	0.47±0.01d

Values followed by the same letter in a column are not significantly different at P = 0>0.05
Keys
1 – Sodium, 2 – Potassium, 3 – Calcium, 4 – Magnesium, 5 – Zinc, 6 – Copper, 7 – Manganese
8 – Iron, 9 – Phosphorus
A=Fresh, B= Boiled, C= Roasted, D= Fermented day zero, E= Fermented day one, F= Fermented day two, G= Fermented day three.

Table 3. Phytochemicals of different treatments of beniseeds

	1	2	3	4	5	6	7	8
A	0.02±0.00a	0.12±0.00a	2.47±0.02d	11.13±0.27e	1.42±0.00b	2.10±0.00c	0.02±0.00a	0.02±0.00a
B	0.01±0.00a	0.06±0.00b	1.25±0.01e	9.09±0.03f	0.57±0.07c	1.04±0.00d	0.01±0.00a	0.02±0.00a
C	0.01±0.00a	0.05±0.00b	0.56±0.01d	11.95±0.04f	0.45±0.00c	0.64±0.00e	0.01±0.00a	0.02±0.00a
D	0.02±0.00a	0.11±0.00b	2.45±0.02e	10.91±0.09f	1.40±0.00c	2.03±0.06d	0.02±0.00a	0.02±0.00a
E	0.01±0.00a	0.01±0.00a	3.46±0.05b	14.55±0.47c	0.00±0.00a	0.05±0.00a	0.00±0.00a	0.00±0.00a
F	0.01±0.00c	0.01±0.00c	3.50±0.00e	0.01±0.00a	0.00±0.00a	0.04±0.00d	0.00±0.00a	0.00±0.00a
G	0.01±0.00a	0.01±0.00a	3.97±0.06b	0.01±0.00a	0.00±0.00a	0.03±0.00a	0.00±0.00a	0.00±0.00a

Values followed by the same letter in a column are not significantly different at P = 0>0.05

Keys: 1-Tanin, 2 – Phenol, 3 – Saponin, 4 – Alkaloid, 5 – Phytate, 6 – Oxalate, 7 – Trypsin inhibitor, 8 – Glycoside,
A=Fresh, B= Boiled, C= Roasted, D= Fermented day zero, E= Fermented day one, F= Fermented day two, G= Fermented day three.

significant effect on the phytochemical, proximate and mineral content of the seeds. Protein value increased significantly when the seeds were subjected to fermentation. Olorunfemi et al., (2006) reported that

fermentation increased the level of protein content in fermenting ogi liquor. Since protein is an essential food nutrient, fermented beniseeds can provide adequate form of it. Also, the level of saponin was greatly reduced by roasting and fermentation. Momoh et al., (2010) Saponin is said to have foaming properties in water and capable of lysing cells (as in haemolysis of erythrocytes) with its powerful surfactant property. Therefore, its reduction in the roasted form will make it a good snack. According to Stedman's Medical Dictionary (2000), phenol is a hydroxyl benzene, an antiseptic, anesthetics and a disinfectant that has been found to be escharotic in concentrated form and neurolytic in 3-4% solution that makes it an escharotic poison internally. Since this particular antinutrient was highly reduced by boiling, roasting and fermentation, it is safer for consumption in these forms. Alkaloid on the other hand is a heterocyclic nitrogen containing substances such as morphine, atropine, codeine sulfate/phosphate and colchicines that makes it possess pharmacological activity and constitute the active principle of the crude drug nature. Cyanogen on the other hand consists of cyano radicals that make it highly toxic, especially to microorganisms and cells.This was completely reduced to traceable form by fermentation and roasting. The results obtained in this work show that the subjection of beniseeds to different treatments has significant effect on its phytochemicals, minerals and nutrient contents of the seeds and these effects can be harnessed to make beniseeds a good nutraceutical supplement. The use of its boiled form for soup equally supported by these results.

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