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THE NUTRITIONAL ESTIMATION OF *CERATOTHECA SESAMOIDES Endl*. TREATED WITH LEAF CRUDE EXTRACTS OF *EUPHORBIA HETEROPHYLLA Linn*. AS NEMATICIDES

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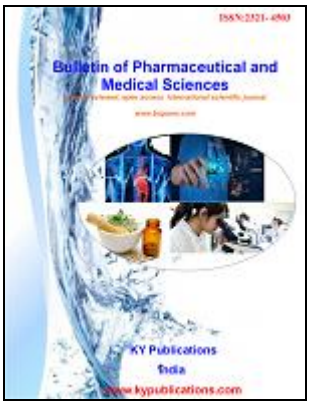

ABSTRACT

Proximate nutrient composition of *Cerathoteca sesamoides Endl.* treated with crude extracts of leaf *E. heterophylla* as nematicide were determined. This is to determine the activity of aqueous and ethanolic extract of this leaf on the nematode as well as their nutritional activity of this plant extracts on the False sesame. For the plant treated with aqueous extract, the nutrient contents in terms of protein, mineral content (calcium, nitrogen and phosphorus) is significantly higher than the plant treated with ethanolic crude extract. Phytochemical analysis carried out showed that the plant extract contains some bio active components that can reduce nematode in the soil as well induce more nutrients in the plant test. *Cerathoteca sesamoides* leaf was found to be potential sources of mineral elements while the whole seeds were richer in other proximate components including moisture and ash contents. The result showed that aqueous extract has more of the phytochemical composition in the crop treated with aqueous extract is higher than that of treated with ethanolic extract. The aqueous extracts produced more activity to antinematodal effect on *Ceratotheca sesamoides* as this can serve as high nutritional food and cash crop.

Keywords: *Ceratotheca sesamoides Endl.*,Proximate composition, *Euphorbia heterophylla Linn.*, Ethanolic and Aqueous, Crude extracts, phytochemicals

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INTRODUCTION

Ceratotheca sesamoides Endl.,known as false sesame, is a weedy ruderal herb of sandy soils that grows up to 100-200cm tall. It sometimes has woody rootstock, which prostrate, erect with pubescent stems. The leaves are opposite, simple, without stipules. The petiole is up to 6 cm long in lower leaves but very short in upper leaves. Bungu, as it is commonly called is an important member of the family Pedaliaceae to which sesame or beniseed (*Sesa mumindicum L.*) also belongs, is native to the northern parts of West Africa (Irvine, 1969; Zeven and de Wet, 1982). In Nigeria, it is widely distributed in variable forms and consumed as a leaf vegetable in the savanna ecological zones. Its mucilage-containing leaves are cooked directly in the soup, thus

there is minimum nutrient loss. However, despite that the leaves and seeds feature prominently in the diet of the indigenous peoples of the savanna zones. In order to ascertain the nutritive value of the crop species and thereby stimulate interest in its utilisation beyond the traditional localities. The major limiting factor to profitable production of *Ceratotheca sesamoides* is the damage by root knot nematodes, Meloidogynespecies. They cause conspicuous root galls and considerable reduction in yield of several host plants and nutrient loss. The symptoms of these diseases are characterized by numerous swellings or galls on roots of the host plants, leading to disruption of water and nutrients uptake, stuntedness, patchiness and chlorosis. Adesiyan (1992) recognized commercial nematicides as the most efficient pesticides in reducing nematode-induced losses on economically important crops. The increased awareness of the prohibitive costs and hazards associated with some of these available compounds according to Jordanaet al., (1994), however has introduced a sense of urgency into the search for alternative nematode management strategies. Research on natural plant products capable of controlling the development and biology of certain nematodes either their direct action on the life cycle, or an improvement of species diversity, has always been considered a good approach to solving the problem. Plants extract have been found to be effective in the control of plant parasitic nematodes (Chatterjee and Sukui, 1980). Extracts from neem (*Azadiracta indica*) and bakain leaves mustard seeds (Siddiqul and Alam, 1989) were found to be highly toxic to juvenile nematodes such extracts also inhibited egg-hatch of root-knot nematode (Hussain et al., 1984). Mohan and Janardhanan (1995)opined that the prohibitive cost of animal proteinin developing countries (of which Nigeria isone) calls for extensive exploitation of plantprotein sources, which are often economicallycheaper. Plant extract also have the advantages of being cheap and readily available over the conventional nematicides. Their environmental safety (Egunjobi, 1974., Egunjobi and Onayemi, 1981., Zureen and Khan, 1984) in an environmentally conscious world also holds promise for their acceptability and use by resource–poor farmers, plant extracts have been found effective for the control of plant parasitic nematode (Chatterjee and Sukui, 1980). The plants extract are also easily degraded, pollution free, leave no residue, cheaper and less toxic. *Cerathoteca sesamoides* being an important indigenous crop, commercially, medicinally and nutritionally, there is need therefore to save this important crop from nematode infection. There is therefore the need to search for suitable and at a certain concentration of extract that are high yielding and even lethal to plant parasitic nematodes, particularly the root-knot nematode which are even a nuisance vegetable production aiming to obtain the maximum nutritional value of the vegetables and to determine the levels of the major nutrients in the leaves and seeds of this important crop treated with leaf extract as a nematicide.

MATERIALS AND METHODS

This research was carried out in the biological laboratory of University of Abuja planting of the test crop (*cerathoteca sesamoides*) was done in the botanical garden, while the and phytochemical screening of test plants and the second was proximate composition of *Ceratotheca sesamoides* plant treated with the crude extract. The experimental design was Randomised Complete Block Design (RCBD). Four by two factorial experiments with four replicates were used at $p<0.05$ or 5% level of significance. Two treatments (aqueous and ethanol extracts) of the plant material were tested at four different levels or doses each while each treatment was replicated five times.

Planting Operation and Application of the Crude Extracts

Planting of the seeds was carried out on sand-filled pots which were arranged in four replicates by five columns and two groups of the ethanolic extracts and aqueous extracts. Three weeks after planting, 5 g of nematode infected roots were weighed and inoculated on the growing crop. Ten days after, the plants were subsequently treated with the crude leaf extracts of E. *heterophylla rangingat* various doses levels including that of 0% concentration (distilled water only). The different concentrations of extract were the stock diluted serially with distilled water from the 100% for the stock solutions, 75%, 50% and 25% w/v were made by serial dilution with distilled water according to the method of Oyedumade (1998). 100ml of both the aqueous and ethanolic crude extracts concentration was applied ring–round of each of the pot of the plant.

Phytochemical Screening

Phytochemical analyses of the plant products of E. *heterophylla* were carried out. The specimen was tested using standard procedures to identify the constituents as described by Culier (1982), Ebanaet. al; (1993), Gandidza (1985), Harborne (1973) Sofowara (1993), and Trease and Evans (1989).

PROXIMATE ANALYSIS OF *CERATOTHECA SESAMOIDES*

Method of Analysis

The methods applied in the analysis are mainly spectrophotometric, gravimetric and titrimetric, and all determinations were carried out in triplicates according to the method described by (AOAC, 1984)

Proximate Analysis

The harvested plant (leaves) was dried in the sun, pulverised into powder, using pestle and mortar so as to provide a large surface area for reaction with the reagents and to ensure homogeneity. After grinding, the powder was sieved through a 0.022mm mesh size. The powder collected was stored in a labeled plastic bottle with cap tightly screwed. Before any analysis was carried out the sample bottles were thoroughly shaken mechanically so as to obtain even distribution The proximate analyses for moisture, dry matter, ash, and organic matter, lipid (fat) content and crude fibre were carried out in triplicates according to the methods described by AOAC (1984). Nitrogen was determined by the micro-kjedahl method as modified by Cocon& Diane (1973) and the nitrogen content was converted to protein by multiplying by 6.25 (Jeanette 1987). Carbohydrate was determined by the Manual Clegg Anthrone method as described by Osborne &Voogt (1978). All proximate results were expressed as percentage of sample

analysed. Estimation of energy value: The sample calorific value was estimated (in kcal/g) by multiplying the percentages of crude protein, crude lipid and carbohydrate with the recommended factors (2.44, 8.37 and 3.57 respectively) as proposed by Martin and Coolidge (1978). Mineral elements analysis: Sodium (Na) and Potassium (K) were determined using the standard flame emission photometer. NaCl and KCl were used as the standards (AOAC 1984). Phosphorus was determined calorimetrically using the spectronic 20 (Gallenkamp, UK) as described by Pearson (1976) with KH2PO4 as the standard. Calcium (Ca), Magnesium (Mg) and Iron (Fe) were determined using Atomic Absorption Spectrophotometer (AAS Model SP9). All values were expressed in mg/100g.

RESULTS

Phytochemical Composition of Crude extracts of *Euphorbia heterophylla Linn.*

Phytochemical studies revealed the presence of saponin, saponin-glycoside, alkaloid, glycosides, volatile oils and triterpenoids, in both aqueous and ethanolic extract. Flavonoids, tannins, terpenes and cardiac-glycosides are found only in aqueous solution of the extract but are not present in the ethanolic extract as shown in (Table1). All phytochemicals present in ethanolic extract are also present in aqueous extracts indicating that water tracts more phytochemical than ethanol. Crude tannin and saponin was the major constituent in *Euphorbia heterophylla* 9.5% and 9.0% respectively in *E. heterophylla*, other phytochemical estimated in this study is present only in very low concentration. These two important phytochemicals are suspected to posses the anti-nematicidal property. Other phytochemicals working together is capable of suppressing the exisitence of nematode and other plant diseases which are not mentioned in this study.

Fresh and Dry Weight of Harvested *Ceratotheca sesamoides Endl.*

The dry weight of the plant harvested in January 2009 (dry season) is significantly higher than the dry weight of plant harvested in October 2008 (rainy season). This could be as a result of excess water accumulated during the rainy season. The plant treated with aqueous extract also has higher dry weight than that treated with ethanolic extracts. And the difference in the dry weight is significant. The plant treated with 100% and 75% concentration of aqueous extract has a higher dry weight than other concentration. There is no significant difference in the dry weight of the plant treated with ethanolic extract as shown in table 2. It was also shown that the fresh weight of plant treated with aqueous extracts is higher than the fresh weight of plants treated with ethanolic extracts. Treatment with aqueous extracts which was found to be able to extract most of the constituents which are suspected to have anti-nematicidal property against *Melodoigyne incognita* and even decay to provide more organic matter which helps the production of the crop. The ethanolic extract

which did not extracts as much as the previously-mentioned extract and this ethanolic extract can still attribute to poor uptake of nutrients and moisture which is mostly required for the good production of the *Ceratotheca sesamoides Endl.* The moisture absorption was higher during rainy season than dry season and when these plants are dried under the shade the weight of plants harvested in January is higher because the watering was controlled unlike that harvested in October that was exposed to uncontrolled rainfall which increased the water content

Table 1. Chemical Composition result of Crude extracts of *Euphorbia heterophylla Linn.*

Chemical	**Aqueous extract**	**Ethanolic extract**
Saponin	+	+
Saponin Glycoside	+	+
Alkaloids	+	+
Flavonoids	+	_
Glycosides	+	+
Tannins	+	_
Volatile Oils	+	+
Phenols	_	_
Hydrolysable tannins	_	_
Steroids	_	_
Triterpenoids	+	+
Terpenes	+	_
Cardiac glycoside	+	_

+ = Present, - = Absent

Table 2 Mean Fresh and Dry Weight of Harvested *Ceratotheca sesamoides Endl.*

Treatment	**Concentration the extracts**	**Dry Weight (g)**	**Fresh Weight (g)**
Control	0%	23.34^{e}	71.10^{d}
Aqueous Extract	25%	47.22^{b}	124.70^{a}
	50%	40.60^{b}	169.20^{a}
	75%	53.79^{ab}	178.09^{a}
	100%	67.76^{a}	258.08^{a}
Control	0%	23.34^{e}	71.10^{d}
Ethanolic Extract	25%	20.92^{e}	45.90^{d}
	50%	21.33^{e}	42.20^{d}
	75%	28.40^{e}	46.10^{d}
	100%	22.70^{e}	42.90^{d}

Means in the same column followed by the same letter do not differ significantly at p=0.05 (DMRT)
Mean value of four replicate

Proximate Composition of *(Cerathoteca sesamoides Endl.)* False sesame treated with aqueous extract

Proximate analysis of the leaves of sesame treated with aqueous extract harvested in two seasons of October 2008 and January 2009, the mature seeds were carried out in respect of the major nutrients. Mean values determined in the crop indicated crop harvested in January produced higher nutrient values than that of harvested in October 2008. It could be that water logged plants are being affected in terms of washing out some nutrient that are supposed to be supplied by the organic matter in the soil. There is also significant

different in the nutrient values determined in the two seasons of rainy and dry season. This harvested plant contain high proteins (19.00- 24.98) %, crude fibre (18.99 -24.89) % and soluble carbohydrate (9.95 – 21.05) %. The amounts of these and other nutrients in the leaves varied with the concentration of the extract applied. The seed contain appreciable levels of fats (17.25 -31.09) %, suggesting that they are potentially capable of being exploited as source of vegetable oil. So also, high levels of protein is contained in the seed signifying that it can also serve as an important food for both the children and adult especially expectant mothers because of its reasonable amount of mineral nutrient contained in the seed of this important crop. This agrees with the report of (Oke, 1966; Oyenuga, 1968; Taylor, 1988), when these results are compared with those reported for the more commonly used leaf vegetables in Nigeria, False sesame is not inferior as far as protein and mineral nutrients in the leaves and seed are concerned.

Table 3 **Percentage Composition of post harvested leaves and seeds of *Ceratotheca sesamoides Endl.* treated with aqueous extracts of *E. heterophylla Linn.***

Concentrations/ Nutrients	0%	25%	50%	75%	100%
Moisture	83.08^{a}	81.28^{a}	79.23^{b}	78.23^{b}	79.01^{b}
Dry matter	16.93^{d}	18.73^{c}	20.78^{c}	21.78^{c}	19.40^{c}
Ash	80.00^{a}	79.50^{a}	64.00^{b}	90.00^{a}	90.00^{a}
Organic matter	20.00^{c}	20.50^{c}	36.00^{b}	10.00^{d}	10.00^{d}
Lipid (fat)	18.93^{b}	17.25^{a}	20.73^{bc}	21.00^{c}	19.25^{b}
Crude Fibre	28.90^{a}	27.60^{a}	24.83^{bc}	25.00^{b}	29.00^{a}
Crude protein	21.30^{bc}	20.50^{c}	22.30^{b}	22.20^{b}	19.00^{cd}
Carbohydrates	9.95^{d}	10.58^{d}	21.05^{a}	19.68^{b}	16.00^{c}
Mineral element					
Calcium	1.70^{a}	1.88^{a}	2.00^{a}	2.28^{ab}	1.75^{a}
Phosphorus	0.30^{a}	0.40^{a}	0.50^{ab}	0.52^{ab}	0.49^{a}
Nitrogen	3.22^{a}	3.11^{a}	3.38^{a}	3.36^{a}	2.88^{ab}
Caloric Value	20.33^{b}	7.93^{a}	11.73^{a}	7.42^{a}	10.90^{a}

Means in the same row followed by the same letter do not differ significantly at p=0.05 (DMRT)
Mean value of three replicates

Proximate Composition of *(Cerathoteca sesamoides Endls.)* False sesame treated with Ethanolic extracts

From the table below, it is observed that the production of the nutrients in the plant treated with ethanolic extract significantly differ from each other according the Duncan Multiple Range Test, but this is in contrast with the analysis of variance table where it shows that the not significantly differ. But it also shows that the plant harvested in October, 2008 contain more moisture, ash and protein to compare the crop harvested in January, 2009. But the content compositions of all other nutrients are higher in the plant harvested in January, 2009 than those harvested in October, 2008. But there is no significant different in the nutrient content of the plant harvested in the two crops harvested. Considering the extracts it is shown that

the aqueous extracts produced a better crop at all concentrations than that of ethanolic extract, but in the concentration 75% and 100% concentration of the dry season crop is better than others.

Table 4 Percentage Composition of post harvested leaves and seeds of *Ceratotheca sesamoides Endl.* treated with ethanolic extracts of *E. heterophylla Linn*. Harvested

Concentrations/ Nutrients	0%	25%	50%	75%	100%
Moisture	83.08^{a}	79.65^{a}	65.99^{b}	70.00^{a}	83.01^{a}
Dry matter	16.93^{b}	20.35^{b}	34.01^{a}	34.00^{a}	16.99^{b}
Ash	80.00^{a}	75.20^{a}	70.00^{a}	75.00^{a}	76.00^{a}
Organic matter	20.00^{b}	24.80^{a}	30.00^{a}	25.00^{a}	24.00^{a}
Lipid (fat)	18.93^{b}	16.20^{b}	18.59^{b}	19.00^{b}	19.00^{b}
Crude fibre	28.90^{a}	28.00^{a}	24.50^{b}	26.03^{ab}	30.00^{a}
Crude protein	20.13^{a}	18.00^{b}	19.88^{a}	18.31^{b}	16.06^{bc}
Carbohydrates	9.95^{b}	9.99^{b}	10.00^{b}	16.08^{a}	14.40^{a}
Mineral element					
Calcium	1.70^{b}	1.68^{b}	1.90^{a}	1.99^{a}	1.68^{b}
Phosphorus	0.30^{b}	0.38^{b}	0.49^{b}	0.38^{b}	0.28^{b}
Nitrogen	3.22^{a}	2.88^{a}	3.18^{a}	2.93^{a}	2.57^{a}
Caloric value	35.68^{a}	49.40^{a}	20.93^{b}	25.09^{b}	21.62^{b}

Values in the same row followed by the same letter are not significantly different at 5% levelof the DMRT.
Mean value of three replicate

DISCUSSION

The increased growth of false sesame grown with treatment of both aqueous extract and compared to ethanolic extract may be attributed to, among others, the decaying potential of the aqueous extract and the increase in nutrient supply to the soil resulting from addition of the extracts which still served as organic manure. The addition of manure to soils leads to a better environment for the growth of roots and canopy. This enhances the utilization of soil nutrient on a consequence of which the nematode damage might have been markedly reduced as observed by Vander Borgett*et al;* (1994). The increased growth may also be attributed to the decrease in nematode number in the soil. The reduction in nematode number may also be responsible for the observed decrease in root–knot indices and increase in yield of false sesame. The decrease in number nematode of high concentration of ethanolic and aqueous extract which led to increased growth and yield as shown in Table 3and 4 are suggestive of the nematicidal potentials of these crude extract (Alam*et al.,*1994).Similar observations on the increase in growth of crops and decrease in number of nematodes as a result of application of the extracts was reported by Babatola (1990) and Akhtar and Alam (1990).This study further establishes the effectiveness of ethanolic and aqueous extracts of *E. heterophylla Linn*. on False sesame which has not been earlier investigated.

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