Elucidation Of Chemical Constituents Of Yam (*D. rotundata*) (Healthy And Infected Tubers) And Some Plants For Tuber Rot Control

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Abstract: The use of plants derivatives for therapeutic purposes against phyto-diseases is achievable. Processing yam tuber into powder for chemical assays: yam tubers were washed, peeled and sun-dried for 48hours, the tubers were milled into flour, using a hand milling machine. Yam extraction for chemical assays: 40g of the flour sample of both unhealthy and rotten yam tubers were dissolved in methanol and left overnight. The mixture was filtered with Whatman No. 1 filter paper and the extracts were used for chemical assays. Qualitative and quantitative tests for phytochemicals: Chemical tests were carried out on the test plants using standard procedures to identify the constituents as described in a standard procedure. Alkaloid, saponins and flavonoid were present in varied proportions in all the test plants; anthracquinone was present in only *V. amygdalina* while glycoside was present in all the test plants except *V. amygdalina,* tannin was present in all the test plants except *A. indica,* and phenols was absent in all the test plants. Moisture, fibre, lipid, flavonoid and tannin content in infected yam tubers were higher than healthy yam tubers. Proteins was mostly distributed in *V. amygdalina*, fibre was highest in *A. indica,* lipid was highest in *N. tabacum,* Moisture content of *C. odorata* was found to be highest among the test plants.
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Introduction

Africa has one of the richest phytodiversities in the world; geographically, its forests span approximately 216,634,000ha. More than 50% of all modern clinical drugs are of plant origin. Diseases control strategies are mostly effective; cheap; non-hazardous; non-phytotoxic but efficacious against phyto-pathogens should be sought (Shivpuri, *et al.,* 1997). Botanical control measure should be explored because of its selectivity; lack of mammalian toxicity; easily biodegradable, relatively cheap; simple to prepare and formulate; non hazardous to non-target organisms; readily available to farmers and are very relevant and promising within the framework of Integrated Pest Management Systems (IPMS) (Ojo and Anibijuwon, 2010).

Materials And Method.

Processing of leaves into powder for chemical assays

The leaves of the test plants were collected, air-dried, pulverized and stored in different labelled clean containers. Ethanol extracts of the test plants were used in carrying out the qualitative test for alkaloid, cardenoides, saponin, tannins, flavonoids and anthraquinones.

Processing of yam tuber for chemical assays

Yam tubers were washed, peeled, sundried for 48 hrs and milled into flour. Forty grams of the flour sample of both healthy and rotten yam tubers were dissolved in methanol and left overnight. The mixture was filtered with Whatman No. 1 filter paper and the extracts were used for chemical assays.

Determination of total phenols by spectrophotometric method:

Fat free sample was boiled with 50ml of ether for the extraction of the phenol component for 15min. Five ml of each extract was pipetted into 50ml flask, and then 10ml of distilled water was added. Two ml of ammonium hydroxide solution and 5ml of concentrated amyl alcohol were also added. The samples were made up to mark and left to react for 30min for colour development. This was measured at 55nm.

Qualitative and quantitative tests of phytochemicals

Chemical tests were carried out on the aqueous extract and on the powered specimens using standard procedures to identify the constituents as described by Sofowora (1997).

Tests for alkaloids

One gram of ethanol extract was dissolved in 5ml of 1% aqueous hydrochloric acid in a steam bath. The solution was sieved with a filter paper, 1ml of the filtrate was tested with 1ml of Drage dust, Meyer's reagent; followed by observation for turbidity and formation of a white creamy precipitate indicated that the test was positive. Turbidity was determined in terms of precipitate formed or change in colour of solution.

Tests for anthraquinones

One gram of ethanol extract was dissolved in 10ml of benzene; the solution was added to the filtrate.

The mixture was shaken. The presence of pink, red or violet colour in the ammonia indicated the presence of free anthraquinones.

Tests for saponins

A gram of the powdered sample was boiled in 20ml and mixed with 5ml of distilled water and shaken vigorously for stable persistent frothing was mixed with 3drops of olive oil and shaken vigorously, then observed for the formation of emulsion; this phytochemical test confirmed the presence of saponin.

Test for flavonoid

The extracts (0.5 ml) were dissolved in methanol. After the addition of a few fragments of magnesium ribbon to the extracts followed by concentrated hydrochloric acid, the appearance of pink colour indicated the presence of flavonoids.

Tests for tannins

One ml of ethanol extract was dissolved in 10ml of distilled water; 1ml of ferric chloride was added to the filtrate. A blue-black or blue-green precipitate was taken as the evidence for the presence of tannins. The procedures were carried out on all other plant samples.

Test for cardiac glycosides

Five ml of each extract was treated with 2ml of glacial acetic acid containing one drop of ferric chloride solution. This was underplayed with 1ml of concentrated sulphuric acid, a brown ring of the interface indicated a deoxy-sugar characteristic of cardiac glycosides, and violet ring appeared below the brown ring, while in the acetic acid layer a greenish ring formed just gradually throughout thing layer.

Determination of ash

One gram of the dried powder plant was taken in a pre-weighed Petri dish and was completely dried in an oven at 100°C for 1 hour. The sample was charred on low flame and then heated at 600°C in a muffle furnace until a white ash was obtained with constant weight. The crucible was then cooled in desiccators and weighed again. The ash contents (%) were determined using the following ash (%) formula =Weight of the Sample after ashing (g)×100/Weight of sample taken (g)

Results

Table 1 showed that Alkaloid (8.72%) and tannin (6.03%) were highest in *O. gratissimum, C. odorata* contained (0.85%) Phenol, Saponin of (12.78 %) was found in *V. amygdalina, S. alata* contained flavonoid of (11.06%), while Ca (10.28%) was found in *N. tabacum.*

Table 1: Quantitative percentage of phytochemicals and minerals composition of the test plants

S/N	Plants	Chemical constituents (%)					
		Alkaloids	Tannin	Saponin	Flavonoid	Ca	K
1	*V. amygdalina*	4.24	1.59	12.78	3.73	0.11	10.04
2	*N. tabacum*	8.58	1.41	8.78	7.80	10.28	10.54
3	*C. odorata*	6.44	3.45	4.30	3.07	0.14	4.78
4	*S. alata*	7.82	2.90	4.42	11.06	0.08	2.35
5	*A. indica*	3.98	0.85	3.66	4.49	0.26	4.46
6.	*O. gratissimum*	8.72	6.03	8.29	7.32	0.28	4.01

Table 2 showed that protein content of *V. amygdalina* (31.21%) was highest; fibre was highest in *A. indica* (17.69%), moisture content was highest in *C. odorata* (10.69%), lipid content and ash value of (12.11%) and (17.96%) were assayed in *N. tabacum* respectively.

Table 2. Quantitative percentage of food composition of test plants

S/N	Plants	Food Compositions	Protein	Fibre	Moisture	Lipid	Ash %
1	*V. amygdalina*	31.21	4.93	9.24	10.34	15.25	
2	*N. tabacum*	15.70	9.20	10.35	12.11	17.96	
3	*C. odorata*	27.83	6.83	10.69	11.81	10.17	
4	*S. alata*	12.22	11.70	4.28	10.23	4.98	
5	*A. indica*	27.70	17.69	8.08	9.95	8.15	
6.	*O. gratissimum*	8.69	6.47	7.66	11.17	11.85	

Table 3 showed that glycoside was present in all the test plants except *V. amygdalina* but anthracquinones was present in only *V. amygdalina,* tannin was present in all the test plants except *A. indica,* and phenols was absent in all the test plants while alkaloid, saponins and flavonoid were present in varied proportions in all the test plants.

Table 4 showed that Moisture, fibre lipid, flavonoid and tannin content in infected yam tubers were higher than healthy yam tubers while the remaining parameters were found to be higher in healthy yam tubers than infected tubers.

Table 3. Qualitative percentage of phytochemical composition of test plants.

S/N	Plants	Chemical Constituents						
		Alkaloids	Anthraquinones	Tannin	Phenolic	Saponin	Glycosides	Flavonoid
1	*V. amygdalina*	√	√	√	X	√	X	√
2	*N. tabacum*	√	X	√	X	√	√	√
3	*C. odorata*	√	X	√	X	√	√	√
4	*S. alata*	√	X	√	X	√	√	√
5	*A. indica*	√	X	X	X	√	√	√
6.	*O. gratissimum*	√	X	√	X	√	√	√

Key: √ = present X= absent

Table 4. Percentage chemical composition of Infected and healthy yam tubers (*D. rotundata*)

Yam tuber S/N Chemical constituents	Infected	Healthy
Alkaloids	1.50	4.95
Tannin	5.54	0.93
Phenol	0.71	0.05
Saponin	4.41	8.03
Flavonoid	2.23	1.56
Protein	2.48	5.25
Ash	1.58	1.66
Fibre	4.61	1.71
Moisture	60.06	57.44
Lipid	7.50	7.76
Ca	Nil	0.02
K	0.80	1.48

Discussion And Conclusion

The consumption of plant material is believed to contribute immensely to the improvement of the health of man, plants and animals. Yedjou (2008) estimated that 80% of the population of Africa depends on medicinal plants to satisfy their health care requirements knowing the nutritional, medicinal and economic values of vegetables found in Africa, could add value to their cultivation, consumption, conservation and commercialization. Furthermore, proper exploitation of such knowledge could help in the fight against hunger and disease-two daunting challenges in the region. Active principles present in plants are influenced by many factors which include the age of plant, extracting solvent, method of extraction and time of harvesting plant materials (Amadioha and Obi, 1999). Extracts of species of various local plants have proven efficacious in protecting yam tubers before and after harvest against rot (Tedela and Ijato, 2013). The test plants have been variously reported to possess fungicidal and insecticidal properties (Alabi *et al.*, 2005). Plant extracts have been used successfully to control tuber diseases of yam, potato and cassava (Okigbo and Emoghene, 2004).

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