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ORIGINAL ARTICLE

Isolation and Identification of C-Flavonol Glycoside from the *Allium cepa* Linn (Onions)

[1]O. U. Osuji*, [2]H. B. Yesufu, [1]F. I. Abdulrahman,[1]I. Z. Khan and [1]B. Audu
[1]Department of Chemistry, Faculty of Science
[2]Pharmaceutical Chemistry, Faculty of Pharmacy, Faculty of Science, P.M.B. 1069,
University of Maiduguri, Maiduguri, Nigeria.
*Email: emekaobi07@gmail.com

ABSTRACT
Allium cepa Linn belongs to the family of Liliaceae. The present work reveals that the flavonoids "Quercetin" structure was isolated and identified from the extraction of Onions species, which was established on the basis of chemical and spectral studies. The abundant of onion consumption (raw/processed) is fully justified as a cancer preventive and it's also appropriate with diets of those suffering from kidney stones, urinary infections or any renal disorders. This study is also of practical importance because Quercetin is an important ingredient of Allium cepa.
***KEYWORDS**: C-flavone glycoside (Quercetin), Allium cepa (Liliaceae), Chemical and spectral studies.*

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INTRODUCTION

Onion is one of the most popular vegetables that are used as ingredient in many food preparations in world wide for centuries [1]. There are over 200 species of onions all over the world but only five (5) species are popular grown in North-eastern part of Nigeria. These include: Red globe (crayon), Sweet Spanish, Yellow globe, spring or Scallion and White globe. The bulb of onions is mainly cultivated in a fertile soil with a lot of chemical and medicinal properties mainly used by all sections of the society (rich or poor) [2].

Most vegetables from leaves, roots or stems of plants are good sources of vitamins, proteins, fibers and minerals element for human nutrition [3, 4]. A great variety of nutrients are found in vegetables consumed everyday through leaves, spinach, cabbage, carrot, onions, tomatoes and so on [5]. Nutrients are chemicals that an organism needs to live and grow from its environments because they enrich the body system, build and repair tissues, which gives heat and energy to regulate the body processes [6].

A study conducted by the National Cancer Institute of USA in 2008, found that those that eat more onions have a much lower risk of developing Stomach Cancer. Therefore, abundant onion consumption (raw/processed) is fully justified as a cancer preventive. This explains why after only a few minutes of eating onions, the breath has its characteristic odour. Onions are mucolytic (able to break down heavy mucus), good expectorant (facilitating the expectoration of bronchial mucus). All respiratory problems or infections starting from sinusitis to pneumonia, improve with onion consumption easily [7]. Onion contains many other non nutritive substance whose medicinal properties are not well defined, they are enzymes onions is rich in enzymatic substances such as oxidase and diastase which have important effect on digestive processes [8, 1].

Generally, any deep green, yellow and orange colored vegetable are rich source of *β-carotene* like Pawpaw, Carrot, Tomatoes, Onions, Pumpkin etc. vitamins B is essential for growth and health eye, skin, nail and so on [9], while the deficiency of it can lead to premature wrinkle, eczema and so on. While vitamin C helps to maintain body tissue, especially bones, teeth, glum and protection against infections. The deficiency can lead to tooth decay, bleeding from gum, premature aging and anemia [10, 11].

MATERIALS AND METHODS

Plant Collection and Identification:

The plant material of *Allium cepa* Linn (Onions) used in this study was collected in November, 2011 from Baga Doro town, Kukawa LGA, Borno state, Nigeria. The plant specimen was identified by a plant

taxonomist of the Department of Biological Science, while the voucher specimen No. 11-007a was deposited at the Post-Graduate Research Laboratory, Department of Chemistry, and University of Maiduguri.

General Experimental Conditions:

The ^{1}H-nuclear magnetic resonance (NMR) spectra were recorded in $CDCl_3$ and CD_3OD on Bruker AM-400 and AMX-500NMR spectrometers with TMS as an internal standard using UNIX operating systems at 400 – 500MHz, respectively. The ^{13}C-NMR spectra were recorded in $CDCl_3$ and CD_3OD at 125MHz on a Bruker AMX-500 NMR spectrometer. The Fourier Transform Infrared (FTIR) spectra were recorded on a FTIR-8400S spectrophotometer. The UV spectra were recorded on a Shimadzu UV-2500PC spectrophotometer. Silica gel columns (230 to 270 mesh) were used for column chromatography (CC), pre-coated silica gel TLC (GF-254, 20 x 20 cm, 0.25mm thick, Merck) were used to check the purity of the compound and were observed under ultraviolet (UV) light (250 and 600 nm), while ferric chloride was used as a spraying reagent.

Preparation of Powder and Extract:

The sample was washed with distilled water to remove the sand particles, air-dried under shade and pulverized into fine powder. The powdered sample of *Allium cepa* Linn (1kg) was soaked in commercially grade 98% ethanol for continuous cold extraction of 12 days at room temperature and ethanol soluble material was filtered off using Whatman No. 1 filter paper. It was carried out so many times; such that all the filtrates were combined and concentrated under vacuum at 40^{o}C using a rotary evaporator till a blackish crude extract of 167.6g was obtained.

Fractionation:

The crude ethanolic extract (100.0g) of *Allium cepa* was suspended in distilled water (200ml) and partitioned with chloroform $CHCl_3$ (200ml), ethyl acetate EtOAc (200ml) and n-butanol (200ml) to yield $CHCl_3$ (9.64g), EtOAc (14.10g) and BuOH (12.04g) fractions.

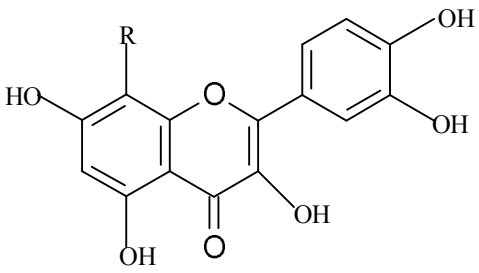
Isolation:

The ethyl acetate fraction of *Allium cepa* Linn was subjected to column chromatography and sequentially sub-fractionated with solvent system of ethyl acetate/Chloroform [5/95(i), 10/90(ii), 15/85(iii), 20/80(iv), 25/75(v), 30/70(vi), 40/60(vii), 50/50(viii), 60/40(ix), 70/30(x), 80/20(xi), 90/10(xii) and 100% ethyl acetate] mixture with increasing order of polarity. The fractions of column were continually using preparative TLC, isolation was further preceded and we selected the sub-fraction (vii) by subjecting it to fresh column chromatography. A shining yellow crystals compound was formed by eluting the fraction with solvent system of ethyl acetate: methanol: water (40:11:1).

RESULTS AND DISCUSSIONS

The isolated portion from ethyl acetate fraction of the *Allium cepa* Linn was chromatographic over silica gel (Preparative TLC) to afford flavonoid. The identification of the compound 'quercetin' was established by direct comparison (UV, FTIR, ^{1}H NMR, ^{13}CNMR) with the authentic sample and reported value in the literature [12]. From the isolated samples, a deep yellow colour crystal with R_f value (0.82) was obtained and melting point of 232 – 234 uncorrected which coincided with a standard quercetin. It is equally soluble in polar solvents and the positive Mg/HCl colour reaction was considered to be a flavonoidal glycoside [13, 2]. The UV- Visible (MeOH): λ_{max} nm 254, 275, 385; FTIR (KBr): 3368.79 (OH), 1653.51(C=O), 1520.92 (C=C), 1444.73 (C – H), 1370.47, 1281.74, 1107.18, 782.16 and 639.42 cm^{-1}; the ^{1}HNMR and ^{1}HCOSY spectra of compound I showed the presence of a set meta coupled aromatic proton assigned to the tetra substituted benzene ring [14] and their signals are: δ9.20(1H,s,5-OH), 10.58(1H,s,3-OH), 8.63(1H,s,3'-OH), 8.72(1H,s,4'-OH), 7.69(1H, d, J=2.1Hz, H-2'), 6.86(1H, d, *J=8.5*Hz, H-5'), 7.25(1H, d, *J=2.4,8.2*Hz, H-6') the trisubstituted aromatic ring are found in 6.50(1H,s,7-OH), 6.25(1H, d, *J=2.*2Hz, H-8) while the presence of 4' hydroxyl group on the B ring protons appears as a four peak pattern which is very importance feature of flavonoids; ^{13}CNMR indicated the presence of 15 carbon skeleton and their signals are: δ157.5(C-2), 136.3(C-3), 176.1(C-4), 161.8(C-5), 98.5(C-6), 163.5(C-7), 93.0(C-8), 157.2(C-9), 103.3(C-10), 123.3(C-1'), 115.5(C-2'), 145.2(C-3'), 150.2(C-4'), 116.0(C-5'), 120.9(C-6'). The spectral studies of the ^{13}CNMR proved the presence of fifteen carbon atoms which suggested that compound 1 is a flavonoid. The absence of proton on ring C suggested that the compound is a flavonol while the presence of a signal at 176.1(C-4) on the ^{13}CNMR spectra indicates the presence of ketonic group [15].

Onions are rich in "glycoquine"(vegetable hormone), that is responsible in reducing the blood glucose level. This explains the onions desirable effects on diabetics which helps to also prevents heart diseases, increases urine volume and facilitates the elimination of waste mineral salts.



R = Glucose

Compound I

CONCLUSION

On the basis of the above findings and spectral studies, we report the isolation and identification of C-flavonol glycoside from the ethyl acetate fraction of the *Allium cepa* Linn which showed basically agreement with the literature [15], the compound is Quercetin. The consumption is appropriate with diets of those suffering from kidney stones, urinary infections or any renal disorders.

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