International Journal of Experimental Research and Review (IJERR)

ISSN: 2455-4855 (Online) ***Original Article***

Received: 11th June, 2016; **Accepted:** 10th August, 2016; **Published:** 30th August, 2016

Phytochemical analysis of groundnut (*Arachis hypogea* L.)

Swapan Mandal

Department of Botany, Brahmananda Keshab Chandra College, 111/2 B. T. Road, Bonhooghly, Kolkata- 700108, West Bengal, India.

Author's E-mail: swapanb1@rediffmail.com

Abstract

Groundnut is among the major world oil seed crops which are the rich source of edible oils and provide a more valuable source of fat, protein, carbohydrate, minerals and some vitamins than any other nut, yet they are often the least expensive as well. Groundnut is an underexploited nut largely consumed by the worldwide including India with its high energy value and also suitable for wide variety of agro ecological conditions. The purpose of the present investigation was to determine the content of fat, protein, sugar, minerals, etc. in the seeds of groundnut variety TG 51 (tolerant to stem rot, released by BARC, Mumbai on 2008 & authenticated by Directorate of Oil seeds Research, ICAR, Hyderabad for Ravi summer season of West Bengal) were processed for experiment, at the Cell & Tissue Culture Wing, Department of Botany of Kalyani University, Nadia, India during the period of 2010 - 2014. The groundnut seeds were cleaned and stored properly at room temperature prior to their use in actual experiment. The proximate analysis revealed that the seeds contained 44.83(%) total lipid, 25.03(%) protein, 15.23 (%) total carbohydrate, 1.02 mg cupper, 162 mg manganese, 3.09 mg zinc, 16 mg sodium, 698 mg potassium, 1.802 mg magnesium and 03.98 mg iron. The phosphorus content (74 mg) was higher than the calcium (91 mg). The major portions of carbohydrate of the seed were present in non reducing form. Therefore, groundnuts may help to play a significant role in human nutrition.

Keywords: Edible oils, fat, minerals and vitamins, protein, reducing sugar.

Introduction

The groundnut, often called as 'The King of Oilseeds', is botanically known as *Arachis hypopgaea* and belongs to family Fabaceae. It is cultivated worldwide and is one of the major oilseed plants cultivated in India In recent times, China, India, the United States and Nigeria have been the major producers of the groundnut (~70% of the world production). During 2014-2015, approximately 37 million metric tons of groundnuts were harvested worldwide, where 19.01% came from India. In many areas of the world, particularly in India, this crop is cultivated in rain fed conditions. Groundnut is resistant to water stress conditions but drought conditions have adverse effects on the pod yield and seed grade (CSIR, 1976, FAO, 1980a, Gohl, 1981). Seeds of groundnut variety TG 51 (tolerant to stem rot) are selected for the study. Groundnuts are energy rich and nutritious foods, providing a valuable supply of a wide range of vitamins, minerals and dietary fibre (Bansal et al., 1993). Contrary to high calorific value, good mineral and nutritional composition, these also

contain some phytochemicals, antinutrients, allergens and toxins which limit their frequent use as food supplements for long time (Grosso et al., 1995).

A careful survey of recent literature revealed that little work has been done on the comparative studies of nutritional values and phytochemical composition of the seeds of groundnuts grown in India. Few investigations were made on the chemical composition and nutritional quality of different groundnut cultivars without producing any guidelines about the phyto - chemical composition of groundnuts cultivated in India & West Bengal (Mandal et al., 2013, Ratnam, 1979). Our studies might be presented the valuable information about the proximate composition, minerals and amino acid score of these groundnut varieties. This paper hence presented the comparative studies on the biochemical and phyto-chemical analysis of *Arachis hypogaea* L. (variety TG - 51) cultivated in West Bengal.

Materials and Methods

Collection of seeds

Seeds were collected from the Regional Research Station, Jhargram, Medinapur (under Bidhan Chandra Krishi Viswa Vidyalaya, Nadia, West Bengal) and planted in May, 2004. Sound mature kernels were handpicked after drying in a hot oven at low temperature. After removing the testa, the kernels were then powdered in a morter & pestle. It was treated with chloroform and methanol (2:1 v/v for 48 hours). The residue were taken for the further experiments. The experiment was completed at National Research Center for Cashew, DK Karnataka, India.

Detection of total soluble sugars

Total soluble sugar was extracted with hot aqueous ethyl-alcohol and the sugar treated with phenol sulphuric acid (AOAC., 1990) with slight modifications. All analyses were conducted in triplicate.

Detection of different mineral elements

The dry ashing method was used. Defatted groundnut samples (0.5 g) were weighed into a crucible and ashed in a muffle furnace at 600oC for 4 h. The ash was cooled and dissolved in dilute HCl (HCl : glass distilled water 1:3, v/v) and a few drops of concentrated Nitric acid added. The crucible was kept on a hot sand bath and boiled. The content was allowed to cool and transferred to 50 ml volumetric flask and the volume made up to the 50 ml mark with Glass distilled water. The above solution was used for the estimation of Zn, Cu, Fe and Mn and phosphorus. For Na, K and Mg, 1 ml of the aliquot was diluted to 25 ml after adding 0.5 ml of a solution containing 50,000 ppm Lanthanum (Lanthanum chloride was added for the suppression of interference). For Ca, the steps for K, Na and Mg were followed except that instead of using 1 ml for dilution, 5 ml was used. The solutions were sprayed into atomic absorption spectrophotometer to determine the concentrations of the various elements with suitable standards. Data analyses were carried out with GenStat (version 5). Protein and lipid quantification was done by following Micro-Kjeldahls process and silicic acid chromatography respectively (AOAC., 1990, Jambunathan et al., 1993, Krik et al., 1991, Lowry et al., 1951).

Results

Proximate analysis revealed that the seeds contained 44.83(%) total lipid, 25.03(%) protein, 15.23 (%) total carbohydrate, 1.02 mg cupper, 162 mg manganese, 3.09 mg zinc, 16 mg sodium, 698 mg potassium, 1.802 mg magnesium and 03.98 mg iron. The phosphorus content (74 mg) was higher than the calcium (91 mg). The major portions of

carbohydrate of the seed were present in non reducing form.

Discussion

Nuts play a significant role in human nutrition especially as sources of vitamins and minerals (Mandal et al., 2012, Ory et al., 1969). The mean concentrations of the minerals evaluated for the three groundnuts plants in this study. However, most of the minerals were reported earlier with a very less amount (Nath et al., 1967, Varner et al., 1963). Minerals serve as cofactors for many physiological and metabolic functions. The presence of a substantial amount of Ca and P in the entire groundnut is a good indication that they are rich in minerals that play a role in bone formation, blood coagulation and muscle contraction along with other metabolic processes. It has also been hypothesized that chronic groundnut consumption would improve serum Mg concentration, Thus reducing the risk of cardiovascular disease (CVD) (Woodruff et al., 2015, Leung Wu et al., 2015). Mn, Cu, & Zn which are parts of the human antioxidant defense systems (Mandal, S et al., 2013) were also present. Therefore, they might be boosting the antioxidant status of individuals. Consequently, they can positively minimize the effects of oxidative stress related diseases in individuals consuming them. The outcome of this research is a very useful contribution to the food composition table. There is a need to release the already developed improved varieties of groundnuts in Nigeria to farmers for mass production, distribution and consequent positive impact on their consumers. Significant genetic variations were observed for the quality attributes studied among the groundnut varieties. This would not only form the basis of selecting parents with desirable attributes for breeding program me but also guide groundnut users the right varieties to choose for their products.

Acknowledgements

The authors wish to acknowledge financial support by Govt. West Bengal. Author is also grateful to Dr. K. V. Nagaraja, Senior Scientist, Dept. of Agricultural Chemistry, NRCC, Puttur, DK Karnataka, for chemical quantification and also to Dept. of Agronomy, Regional Research Center of B.C.K.V.V. (Jhargram Centre, Medinipur) for providing technical assistance towards completion of the Research pursuit.

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