Comparative Analysis of Aqueous Extract of Allergic Food Samples

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ABSTRACT

Allergy is one of the most common diseases across the globe. Despite several efforts being made, incidence of allergy is continuously rising. Among the several causes, food is one of the most important reasons of allergy. In the present study, we used seven allergic food products Arachis hypogaea (peanut), Glycine max (soy), Beta vulgaris (beetroot), Avena sativa (oats), Solanum melongena L. (eggplant), Brassica oleracea var. italica (broccoli) and Allium cepa (onion). Phytochemical analysis of aqueous extracts of these seven samples was done in the laboratory. Phytochemical analysis consists of assessment of primary and secondary metabolites. Primary constituents consist of free amino acids, polysaccharides, protein and chlorophyll. The main objective of the research work was to check the total content of polysaccharide and free amino acids in the selected samples.

Key words: Biochemical characteristics, Differential allergic reactions, Food allergy, Non-communicable disease.

INTRODUCTION

Allergy is a hypersensitive response of immune system against any foreign invaders like dust, mite, pollen, food. Food allergy is an abnormal response of the immune system to food proteins. Allergy caused by food proteins shows several skin, gastrointestinal and respiratory tract disorders involving IgE mediated and non IgE mediated mechanisms (David, 1985; Sloan et al., 1986; Sicherer and Sampson, 2006; Zuidmeer, et al., 2008).

Children are mainly affected by allergy caused by Arachis hypogaea (peanut) which have doubled in the recent decades. Symptoms of peanut allergy include rashes over joints and skin creases, oozing, crusted rash. Peanut oil can cause allergy through inflamed skin. Peanut allergy can sometimes be life threatening both in adult and children (George et al., 2015). Studies have shown that Glycine max (soy) is allergic to mainly infants with cow milk allergy. Infants with atopic symptoms have shown a positive result for soy allergy (Cordle, 2004).

Although Beta vulgaris (beetroot) allergy is rare, ingestion of boiled beetroot can lead to urticarial and asthma. Symptoms like throat tightening, generalized hives and bronchospasm may also occur due to boiled beetroot intake. Studies show that it is an IgE mediated reaction.

Cases have been reported on allergy caused by Avena sativa (oats). Symptoms of oats allergy range from urticarial, dyspnea, anaphylaxis and asthma. Prevalence of asthma to farmers working with oats has been reported to be 17.4% (Ootake et al, 2015).

Solanum melongena L. (eggplant), one of the most common causes to food allergy contains 5 allergens of 36-71 kD. The raw pulp contains 3 allergens of 52-71 kD and the peel contains 9 allergens of 26-71 kD. Eggplant triggers IgE mediated hypersensitivity reactions. The symptoms vary from wheezing, skin rashes, itching of eyes, gastrointestinal abnormalities, itching and hoarseness of throat (Bheemanapalli and Yeldur, 2009).

Brassica oleracea var. italica (broccoli) allergy is a rare case which leads to Mugwort-mustard allergy syndrome (MMAS). It is an example of Pollen-food allergy syndrome (PFAS) that occurs to people sensitized to pollen. Broccoli allergy is an IgE mediated hypersensitive reaction (Liao et al., 2013; Sugita et al., 2016).

Allium cepa (onion) belonging to the family Liliaceae is responsible for allergic symptoms like rhinoconjunctivitis, contact dermatitis, bronchial asthma, chest tightening, wheezing and gastrointestinal problems. IgE antibodies against onion have been found in patients allergic to onion (Valdivieso et al. 1994).

In the present study, we examined the content of polysaccharide and free amino acid in the seven samples. Polysaccharides are polymeric carbohydrate molecules that are composed of long chains of monosaccharides linked by glycosidic bonds. Polysaccharides are major structural components in plants. The role of polysaccharide is to impart strength and rigidity to plant cell walls and serve as an energy source and stored energy. Amino acids are organic compounds that form the building blocks of the body, proteins. Free amino acids play a vital role in protein biosynthesis as well as in plant stress response.
**MATERIALS AND METHODS**

Samples were collected from local market in Kolkata region, West Bengal, India. Healthy and uninfected edible parts of samples were chosen. The samples were thoroughly washed in running tap water and dried.

**Preparation of sample extracts**

**For polysaccharide**

50 grams of eggplant, peanut and broccoli and 25 grams of onion, beetroot, soy and oats were ground in 5 ml of distilled water. The solution was centrifuged at 1500 rpm for 20 minutes and the supernatant was taken. The supernatant is the crude extract of the samples and was subjected for determining polysaccharide content.

**For free amino acid**

50 grams of all the samples were measured and ground in 5 ml of distilled water. The solutions were subjected to centrifugation at 1500 rpm for 20 minutes. The clear supernatant is the crude extract of the samples and was taken for determination of free amino acid content.

**Biochemical analysis**

Determination of polysaccharide content and free amino acid content was done according to two different protocols (Wadood *et al.*, 2013).

**Polysaccharide content**

470 ul of phosphate buffer was added to 30 ul of extract. Following the addition of phosphate buffer, 500 ul of 50% phenol and 2.5 ml of sulphuric acid was added. After incubating the solution for 30 minutes, absorbance was measured at 480 nm and the calibration curve was made using dextrose as standard.

**Free amino acid content**

100 ul of ninhydrin and 100 ul of 50% ethanol was added to 100 ul of extract and mixed well. The solutions were kept in water bath (80°C) for 15 minutes. 2 ml of distilled water was added to each sample tube after taking out of the water bath. The absorbance was measured at 570 nm and the calibration curve was made using lysine as standard.

**RESULTS AND DISCUSSION**

The research work was carried out on seven selected allergic plant food products which shows that phytochemical constituents i.e. polysaccharides and free amino acids are either present or absent in these samples and the results were graphically represented below.

This study has revealed that free amino acid is absent in onion, beetroot and eggplant. Peanut has the highest amount of free amino acid. Test for polysaccharide showed
that all the samples contain polysaccharide with soy having the highest amount of polysaccharide and oats having the least amount.

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