

esters of phytosterols, but also because it appears to be the most abundant source of stanols and stanol esters (Moreau et al. 1996). Phytosterols and phytostanols hinder the intestinal absorption of cholesterol. The cholesterol-lowering property of these compounds has been established some decades ago. For example, β -sitosterol has been used from 1950s as a supplement and as a drug (Cytellin, marketed by Eli Lilly) for reducing the serum cholesterol levels in hypercholesterolemic individuals (Hicks and Moreau 2001).

It is also equally effective in reducing plasma cholesterol and plant sterol esters, unlike stanols, which increase their own absorption. The resulting increased serum sterol levels would result in values seen as in phytosterolemia, a strongly atherogenic hereditary metabolic abnormality.

As of September 2000, the U.S. FDA has allowed a health claim for reducing the risk of coronary heart disease for foods products, such as spreads and salad dressings, containing phytosterol and phytostanol esters (Jones and Raeni-Sarjaz 2001).

2.2.7 BETALAINS

The name 'betalain' is designated from the Latin term of the common beet (*Beta vulgaris*), from which betalains were first extracted. The deep red colour of beets, amaranth, bougainvillea and many cacti results from the presence of pigments. Betalains are a class of red and yellow indole-derived pigments present in plants of the *Caryophyllales*, as well as in some higher-order fungi, where they replace anthocyanin pigments (Strack et al. 2003). There are two categories of betalains: Betacyanins comprise the reddish to violet betalain pigments and betaxanthins that are those betalain pigments that impart yellow to orange colour.

Amongst the betaxanthins, various types of pigments are present in plants, which include vulgaxanthin, miraxanthin, portulaxanthin and indicaxanthin (Tiwari et al. 2013). The few edible known sources of betalains are red and yellow beetroot (*Beta vulgaris* L.ssp. *vulgaris*), coloured Swiss chard (*Beta vulgaris* L. ssp. *cicla*), grain or leafy amaranth (*Amaranthus* sp.) and cactus fruits like those of *Opuntia* and *Hylocereus* genera (Azeredo 2009).

2.2.8 ALKALOIDS

The term 'alkaloid' was coined in 1819 by Carl Friedrich Wilhelm Meissner, the German pharmacist, to refer to plant natural products, which was found to show basic properties similar to that of the inorganic alkalis. The ending '-oid' is still in practise even today, which suggests the similarity of their structure or activity, as is evident in modern names such as peptoid, terpenoid or vanilloid (Hesse 2002). Among the secondary metabolites that are produced by plants, the alkaloids act as a very prominent class of defence compounds. Over 21,000 alkaloids have been identified, hence they constitute the largest group among the nitrogen-containing secondary metabolites (besides 700 nonprotein amino acids, 100 amines, 150 alkylamides, 100 glucosinolates and 60 cyanogenic glycosides). Alkaloids are usually present as a mixture of a few major and several minor alkaloids of a particular biosynthetic unit, which differ in functional groups (Wink et al. 2005).