Across the food guide pyramid, my plate, my pyramid; fruits and vegetables including green leafy vegetables are considered as priority items among foods (Anon., 2011). Green leafy vegetables are the nature’s storehouse of micro and macro nutrients. These are also termed as anti-ageing wonders as they are rich source of antioxidants and important phyto-chemicals. Phyto-chemicals like chlorophyll (a green pigment, which act as anti-cancerous agent due to forming complexes with mutagens), β-carotene (a masked pigment, which act as important precursor of vitamin A), along with other vitamins (vitamin C, vitamin E, vitamin B9) and minerals, places the green leafy vegetables under the category of protective food. Presence of dietary fibers in leafy vegetables further plays an important role in maintaining gastro-intestinal health. Thus, the food based approach for overcoming micronutrient malnutrition using green leafy vegetables (GLVs) is a meaningful option due to the associated benefits (Gupta and Prakash, 2011).

Spinach among the green leafy vegetables (GLV) is important and known for its anti mutagenic and antimicrobial properties (Vazquez et al., 2013). Spinach is an excellent source of chlorophyll and phyto-nutrient such as beta-carotene; whereas, lutein, violaxanthin and neoxanthin are the other major carotenoids present in spinach. Anti aging properties associated with spinach leaves with considerable amount of micro and macro nutrients make this leaf a unique food material. Presence of specific vitamins further makes this important leafy vegetable an antioxidant rich biomaterial which also enhances bioavailability of minerals particularly iron and calcium (Anon.,
Moreover, it is confirmed that spinach leaves have the protective action against certain cancers, cardiovascular diseases and eye disease such as age-related macular degeneration (Altemimi et al., 2014; Ranganna, 1997) also neural tube defects and spina bifida in newborn infants.

Mustard is also a popular spice, which is added to many foods towards an attempt to provide traditional flavour. It is frequently used as an important ingredient in sausages, spice blends, salad dressings, marinades and convenience products (Palle-Reisch et al., 2013). Mustard, also termed as brown mustard or Indian mustard, is highly appreciated in international market because of its appetizing flavour and is used largely for tempering a specific food. It is used in medicines as inevitable herb due to presence of vitamins and minerals. The protein of mustard is of excellent nutritional quality being rich in lysine containing amount of sulphur containing amino acids, which is being limiting in most of the cereals (Sadeghi et al., 2006; Anon., 2011). In spite having good nutritional value, high preference of the local consumer is due to its strong pungency (Shrestha et al., 2014). Mustard leaves based sarson ka saag a popular Indian dish is often consumed with makki ki roti (flat maize bread).

Fenugreek constitutes as one of the major spices in the world, which contributes towards economic development (Meghwal and Goswami, 2013). Fresh green fenugreek leaves are used in flavouring various vegetables as principle or side ingredient. The green fenugreek leaves (fresh or dried) are considered as herb (Meghwal and Goswami, 2012). Review reveals that less than 1% plants are experimentally tested among 2.5 lakh plants. 800 plants shown anti-diabetic ingredient, but edible plants are only 45 and fenugreek is one of them. Due to its ability to prevent diseases, beyond its nutritional benefit, it is termed as functional food plant.
Brassicaceae plant’s family includes radish, apart from several crops (Ngouajio, 2004). Radish leaves come under leafy vegetables, like several other leafy vegetables which include spinach leaves, mustard leaves, fenugreek leaves, curry leaves and many more (Gutierrez and Perez, 2004). The typical radish odour is contributed by butyl crotonyl isothiocyanate sulfide as a chief constituent. Radish leaves possess nutraceutical properties. Further, the leaf proteins have good biological value (76.6%) with around 73.5%, digestibility co-efficient (Singh and Singh, 2013). Vitamin C content is six times more in leaves as compared to its roots. Nitrate levels in radish leaf were greater (3-5 times) than that in the root irrespective of any treatment (Levine et al., 2008). Ethanol extract of the aerial leaf parts of *Raphanus sativus* L. contained good amounts of polyphenols and total flavonoids, shows higher antioxidant activity. It is reported that radish leaf is of clinical use as an antitumor agent because it inhibits the growth of tumour cells and induces apoptosis (Kim et al., 2011). Radish (*Raphanus sativus* L.) displays high amylolytic activity (Hara et al., 2009; Rashad et al., 1995). The phenolic acids content in the roots of the radish are much smaller than in the leaves and the leaves also contains higher amounts of peptic substances (Gutierrez and Perez, 2004). Radish leaves act as detoxifying agent and are used on pharmacological basis for gut stimulatory activity and traditionally used against constipation (Singh and Singh, 2013). Studies revealed positive influence of radish leaves consumption on reducing the risk of developing cardiovascular diseases (CVD) and cancers mainly due to the presence of various photochemical, especially glucosinolates, polyphenols and flavonoids (Kuang et al., 2013).

Available literature indicates that, devoid or lower methionine content (Aletor et al., 2002), the overall amino acid profiles of protein present in leafy vegetables from most species compare favorably with those of soybean, meat, fish and even egg.
As, increasing popularity of these GLVs, which also act as herbal plants has enhanced their commercial importance, as in food and chemical industries dehydration operations (Krokida et al., 2003; Agueroa et al., 2005; Doymaz et al., 2006; Mujumdar, 2015) are gaining importance especially on the storability and round the year availability point of view. It has the objective to remove the water content to a certain safe level, so that the deterioration reactions and microbial spoilage can be retarded. Perishable leafy vegetables; have high exposed surface area and can either be consumed within a day or two after harvesting or has shelf-life which is too short. Considering the key gaps with the use of perishable leafy green vegetables, attempts were made to utilize GLVs in dried form for the product development, also as potential remedies to the associated various issues. Attempts were carried with stabilized form (dried form) of GLVs which lead to a concentrated source of nutrition, using leafy vegetables named spinach, mustard, fenugreek and radish.

Moisture adsorption isotherms are said as an important tool for predicting the fate of the products at shelf. In an attempt to predict the moisture content during storage periods under a variety of conditions is very important for reducing the time and eventually the cost of product development (Arslan and Togrul, 2005). Further, the mathematical models are said as the method to ascertain the adequacy of investigational data, which got fitted to several model equations. There are enormous adsorption 1-2-3 parameter equations; Smith, Polynomial, BET, Hailwood and Horbin and GAB equations etc which describes the isotherm for shelf stable dehydrated powders over the entire selected range of temperatures. Thermodynamic functions are calculated from moisture sorption isotherms and this provides a thermodynamic approach to easy the interpretation of experimental findings with respect to statement of theory (Kaya and Kahyaoglu, 2007). The study of sorption isotherms at different
temperatures allows an evaluation of the heat of sorption, which determines the binding strength between an adsorbent (food material) and adsorbate (water molecules). The isosteric heat of adsorption varies with the amount of water molecules adsorbed by the substrate. The differential entropy of a material is proportional to the number of sorption sites and is dependent on energy levels (Al-Muhtaseb et al., 2004; Sinija and Mishra 2008). Free energy drives chemical reactions, which further is responsible for variations in the chemical compositions of the associated food materials (Toledo, 1997).

Leafy vegetables are often categorized under highly perishable category of foods. Therefore, processing of perishable leaves into shelf stable form having maximum possible retention of quality characteristics is of prime concern for their wide applications mainly as the supplements in the development of specialized food products.

The leaves of mustard and spinach are being considered as part of healthy meals and are used as major ingredients in traditional and popular Indian cuisine viz. sarson ka saag. The preparation of sarson ka saag is basically carried out traditionally by the persons as legacy passed from their elders and thus restrains the characteristic flavour.

Incorporation of radish leaf powder and fenugreek leaf powder into ready-to-eat expanded snack food can be the timely approach. Adding these powders to traditional starchy expanded snacks can enhance their nutritional properties as well as adding the functionality. Further, coating process using adequate oil blend and spice mix can upgrade the extrudates up to coated extruded products with richer appearance and delicious taste.
To the best of our knowledge, limited published information is readily available regarding use of green leafy vegetable powder for the production of ready to prepare saag, a traditional delicacy in Indian diet. Additionally, literatures on the production of extrudates and further coating it, both using green leafy vegetable powders, are fragmentary. Hence, there had been an urgent need for the research work in this noble aspect. It is essential that scientific and traditional knowledge should go together to find mutually beneficial results. In view of the above, the present work has been carried out to fulfill the following objectives:

i. To study the effect of pretreatment and dehydration temperature on the product characteristics of leafy vegetables

ii. To study the dehydration behavior of leafy vegetables at different temperatures

iii. To study the temperature dependent adsorption behavior of dehydrated leafy vegetables in different forms

iv. To characterize the dehydrated green leafy vegetables for its suitability for functional ingredients.