Chapter I

Introduction
Soybean \((Glycine \textit{max} \textsc{(L.) Merrill})\) is an important legume and oilseed crop belonging to the family \textit{Leguminosae}, subfamily \textit{Papilionoideae} and genus \textit{Glycine}. Soybean is believed to be South-East Asian origin and reported to be extensively cultivated in China from pre-historic times i.e. 2838 BC. (Cdlwell, 1973). Wild form of soybean occurs in China, Manchuria and Korea. The soybean is generally considered as a crop best adaptable to temperate zones, but it has been also grown in many tropical regions of South-Eastern Asia, India and Africa. Soybean is not new to India. Black soybean has been cultivated for ages in the low hills of the Himalaya in Northern India. Soybean is a short day and light demanding plant and it can withstand in adverse conditions as compared to cereals.

Soybean has become a miracle crop of the twentieth century and is often designated as a “Golden Bean”. It is a triple beneficiary crop, unique food, valuable feed and an industrial raw material with considerable potential. The soybean ranks first in world oil production and is a cheap source of protein for food and feed. Soybean is also known as ‘poor man’s meat.’ The tropical and subtropical countries including India depend for
dietary requirement of protein on less productive and nutritive pulse crops. Soybean yields are two to three times higher than those of pulse crops, which are the major sources of dietary protein. Soybean also contains twice the quantity of protein (approximately 40%) and 20% oil, (Gopalan et al., 1971). Soybean oil is rich in unsaturated fatty acids with anti-cholesterol property (Singh, 1985). Soybean protein is much cheaper than any pulse crop in India. Soybean protein contains a good balance of amino acids, essential to human nutrition. It is also a good source of lysine an important amino acid in addition to methionine and cystine. Soybean is very important to vegetarians on an account of its richness in protein, fat, carbohydrate (20%) vitamin 'A' (710 IU), vitamin B (300 IU), vitamin C,D,E,K, minerals, salts, viz. Ca, Mg, P and Lecithin in small amount. Hundred grams of soybean provides 400-430 calories as against 350 calories from same quantity of cereals.

Manickam (2001) reported soybean protein content is as high as of 52%, much more than the protein content of fish, meat and poultry products. It helps to reduce cholesterol level in blood. Soybean weighing \( \frac{1}{4} \) kg gives protein equal to that of 3.5 litres of milk or equal to that of available in 24 eggs. It has the power to defend our system against cancer. Similarly, natural calcium, magnesium, phosphorus etc are present in soybean. Blood cancer too can be prevented. It is good for pregnant women. It also helps us to solve problems pertaining to irregularity in periods of women. It causes the melting of all
kinds of stones in the urinary tract. Soybean creates alkalinity in body after digestion whereas cereals after digestion creates acidity in body.

Soybean is proved to be the best material for industries like bread, biscuits, chocolates, soap etc. Soybean is used in the manufacture of lard, vegetable ghee, paints, varnishes, glycerine, plastic cloth, printing ink, rubber, linoleum, candles and also paper and used in textile industry in America, Japan and China. Soybean is also used for production of antibiotics and as an animal and poultry feed and hydrogenated oil. Soybean oil is recommended in case of stomach diseases and diabetes in India.

Among the tropical countries, Indonesia, Thailand and India are major soybean producers in the Asia. Largest producers in the world are USA, China and Brazil. However, the crop was not very much popular in India, Indian sub continent and tropical countries. The share of India in world soybean production in 2001 was conspicuously insignificant. It was producing only 3% of the world's soybean. The important soybean producing countries in those years were the USA (45%) followed by Brazil (21%) and Argentina (15%). India is fifth larger soybean producer after USA, Brazil, China and Argentina. Nowadays the importance of soybean in India has been recognised as indicated by the increased area under soybean to the tune of 60 lakh hectares, which come to 8.50% of world's soybean with production of 5600 thousand metric tonnes (Damodaran and Hegde, 2002).
Soybean was first introduced in Maharashtra by missionary peoples in 1919. Madhya Pradesh is the major soybean producing State followed by Maharashtra in India. Maharashtra has an area of 11.42 lakh hectares with production of 1266.20 thousand metric tonnes (Damodaran and Hegde, 2002). However, the average productivity of soybean in India and Maharashtra 9.33 and 11.09 qt/ha, respectively. The average productivity of soybean in Brazil, USA and Argentina were 27.04, 26.63 and 25.91 qt/ha, respectively (Damodaran and Hegde, 2002). Thus there is a great potential to this crop in India.

Recently, the cultivation of soybean is increasing day by day in Maharashtra including Marathwada region. Due to its certain benefits like capacity of crop to yield in three seasons like kharif, rabi, summer, short duration crop, least pest and disease attack and high yielding ability with good market price.

In general, environment plays an important role in production of quality seed. Among the various factors seed size may have influence on rate of germination. Environmental factors; such as temperature and humidity has great influence on production of quality seed. Harvesting of soybean crop at physiological maturity is important to maintain maximum vigour and viability of seed and to avoid losses at the time of harvesting. The stage of physiological maturity denotes peak seed vigour and viability (Thomson, 1979). Pod shattering is one of the lacunae that take a heavy toll to produce. Extent of yield losses due to pod shattering in soybean range from negligible to
as high as 90% depending up on the time of harvesting, environmental conditions and genetic endowment of variety (Tiwari and Bhatnagar, 1988). Another major problem of its cultivation is the delicate nature of seed coat, which is fragile and is prone to damage embryo during various stages viz. harvesting, threshing, processing, seed treatment, transport and storage.

The constraints in soybean seed production are becoming increasingly evident especially those associated with seed quality problems, which is dependent on the manner in which seeds are handled during harvesting, processing and storage. The environmental and physiological factors are also involved. Loss of seed viability during storage and resultant poor stand are the major constraints in soybean production in tropical and subtropical countries mainly owing to prevailing high temperature and high relative humidity (Wien and Kueneman, 1981). Soybean seed production shows great promise in the tropics. High quality seed that provides adequate plant stand is the basis for profitable production and expansion of this crop. In order to increase the production of soybean, a source of high quality, disease free seed must be established and maintained. Loss of viability and vigour under high temperature and relative humidity conditions is a common phenomenon in many crop seeds but it is well marked in soybean. Justice and Bass (1978) reported that soybean suffers from poor seed longevity and reported included soybean in the least storability group in their
relative storability index. Production of high quality seed, which retains its viability through a storage season, is a major challenge in most areas of the humid tropics and subtropics. Oathout (1928) reported rapid loss in viability of soybean seed. Gregg (1982) reported that soybean can not be stored well at high and low seed moisture and high storage temperature. Delouche et al. (1973) also reported that the storability of seed is largely determined by its inheritance, pre-storage history and the condition and length of storage.

Soybean seed deteriorates faster than those of most other crops (Priestley et al., 1985), especially under tropical conditions (Delouche et al., 1973). Two main factors which appear to contribute to the low storability of soybean seed. One is relatively short intrinsic longevity of soybean seeds as indicated by the low KE (Ellis et al., 1982). The other factor is highly permeable seed coat because of which soybean seed imbibes moisture easily and thus tends to more susceptible to weathering in the field (Burchett et al., 1985 and Tekrony et al., 1980) as well as to humid tropical environments under open storage conditions. Besides inherent poor storability, mechanical damage is one more factor strongly responsible for seed quality deterioration especially by small farmers in developing countries which has been overshadowed by more important problems such as storage deterioration, insect infestation and diseases (Wilson and McDonald Jr., 1992).
Seed which are free from pathogens can be expected to survive for longer period. Environmental factors during storage which most markedly influence maintenance of viability are temperature and seed moisture content. Loss of viability of seed caused by damage of seed due to environmental factors. It has been reported that the extent of losses due to damage of seed ranges from 10 to 30% (Copeland, 1972). With invisible damage, seed could take vigour resulting in reduced yield.

In view of the above circumstances, the present investigation was undertaken to study the soybean seed quality parameters with the following objectives.

1) To study the seed production feasibility in different seasons.

2) To study the effect of seasons on different parameters of seed quality and storability of seed.

3) To study the changes in physico-physiological and physico-biochemical components during storage.