Chapter-I

INTRODUCTION
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Among the different oil seed crops, India ranks first in castor, safflower and sesame in production and is second in groundnut and ranks third, fourth, fifth and sixth in rapeseed-mustard, linseed, soyabean and sunflower, respectively (Damodaran and Hegde, 1999) In India, among the oil seed crops grown during Rabi, linseed is next in importance to rapeseed-mustard in area as well as in production. Although it is a non-edible oil crop.

Linum the largest genus of Linaceae with about 20 species displays great diversity in karyotype, morphological and biochemical characteristics. The genus Linum is primarily known for its species Linum usitatissimum as given by Linnaeus, 1857 is under cultivation since prehistoric times in the world for its oil and fibre. It has been cultivated in the area of Mediterranean coastal lands, Asia Minor, Egypt, Algeria, Turkey, Spain, Italy and Greece for fibre. In South-West Asia, Turkistan and Afghanistan, it is mainly grown for oil. In Asia Minor for oil, meant both for edible as well as industrial uses.

Based on area occupied by linseed in India, the major linseed growing states are Madhya Pradesh, Uttar Pradesh, Maharashtra, Bihar, Rajasthan, Orissa and Karnataka in that order which all together contributes more than 95 percent of the total linseed in area as well as production. During 2000-01 linseed had an area of 590.70 thousand tonnes. In Uttar Pradesh, it had occupied an area of 132.20 thousand hectares with the production of 47.00 thousand tonnes. The average productivity of this crop is less (3.20 q/hect.) which is definitely low as compared to global average (Annonymous, 2002).
Linseed is basically an industrial oil crop and each and every part of it has got commercial importance. About 20 percent of the seed is directly used for edible purpose in certain pockets of Chhattisgarh state, Chhota Nagpur areas of Jharkhand and some parts of Vidharbha region in Maharashtra and about 80 percent of the oil goes to industries for the manufacturing of paints, varnish, oil cloths, linolen, pad-ink, printing ink, soaps, etc. Recent discovery is the use of linseed oil in processing of cementing roads in USA (Walsh, 1965) and antibiotics (Anonymous, 1968) have given it a new importance. Antibiotic “linatime” found in seeds of linseed could cure diseases in men and animals against which no known medical treatment is available. Linseed oil is rich in omega-3 fatty acids known to influence blood platelet aggregation, lower blood cholesterol concentration and prevent coronary heart disease (Kolodziejczyk et al. 1995). The oil cake after extraction of oil is good food for milk cattle and also used as organic manure to maintain the soil fertility as well as to prevent the unwanted microbes with its germicidal properties.

Linseed fibre has equal importance as it is used to blend successfully with wood, silk, cotton, canvas, suiting, shirting and various items for different purposes. After extraction of fibre, the straw is utilized for preparation of straw boards, high grade writing papers and so on. Nevertheless, the rough and strong fibres of linseed is effectively used for preparation of low cost roofing tiles based on convertible polymers. Now, there is more emphasis to evolve double purpose varieties/cultivars which may be capable of producing seed equal to the best seed type and fibre equal to best flax type in the country.
India is the net importer of edible oil and nearly 20 percent of linseed oil, in spite of more than 50 percent linolenic acid contents in oil is used for edible purposes in the country. Now, new vista has been emphasized which has an added advantage of the programme after the CSIRO, Canbara, Australia. It is a plus point that these varieties carry linolenic acid content less than 5 percent. Therefore, there is a need to formulate the research strategies for breeding linseed varieties for edible (less than 5% linolenic acid) and technical (Fibre) purposes separately.

Just looking into the fastly growing Indian population, it has been estimated that 26 million metric tonnes of oil will be required by 2001 A.D. to cater the need of the enhanced population. It clearly signifies that there is need to double the oil seed production in order to meet the demand which will be felt by our population in coming years of time. In Linseed, average productivity is very less at both country and state level as compared to other oil seeds due to certain reasons which directly/indirectly causes less production. The most possible reason of this low yield of this crop in India is inadequate knowledge of improved technology to the farmers, narrow genetic base, poor adaptability of different strains under different ecogeographical region. In some area as this crop is grown under utera condition where very little yield is obtained.

Keeping the above view points, research efforts are needed for developing high yielding varieties in Linseed. The success of any plant breeding programme depends largely upon the choice of superior parents for hybridization and also knowledge and understanding about the nature and magnitude of gene actions involved besides genetic association of various
characters with seed yield together therefore, several biometrical approaches have been used by several workers. These are line tester (Kempthorne, 1957) Partial diallel (Kempthorne and Curnew, 1961) and diallel cross (Jinks and Hayman, 1953, Hayman, 1954, 1957, 1958, 1960, Jinks 1954, 1955, Kempthorne, 1956, Griffing 1956 and Gardner and Eberhart, 1966) techniques. Among these diallel cross technique is very convenient method and has been widely used in different crops.

India has greatest agroclimatic diversity therefore, the variety should be evolved with stability of traits possessing wider adaptability in the situation. It is also required to see the impact of different environments on the varieties for identification of stable parents and their progeny for wider exploitation for sustainable production programme.

In order to determine, the stability of the variety some methods have been suggested giving various components (Plaisted and Peterson, 1959, Allard, 1961, Griffing and Langridge, 1963) Regression analysis suggested by Yate & Cockerham (1938) and supported by Finley and Wilkinson (1963) later on and finally suggested by Eberhart and Russell (1966) was used in linseed in measuring adaptability to limited extent.

The linseed crop has not been given due attention, therefore, could not be studied intensively on all the aspects discussed above. The present investigation, "Studies on stability parameters and biometrical traits of yield and yield contributing characters in Linseed (Linum usitatissimum L.)" was therefore, designed to derive the informations on the following aspects. To estimate the genetic components of important metric and quality attributes in parental stock and their combinations.
(i) To determine general and specific combining ability variances for all the characteristics in this investigation

(ii) Determination of general and specific combining ability effects of the parents involved in the study and their progenies in order of sequence

(iii) Determination of hybrid vigour in F₁ crosses and inbreeding depression in F₂ population with regard to each attribute

(iv) Estimation of heritability and genetic advance (genetic gain) in respect of all the characteristics

(v) To see the suitability of the genotypes and their adaptability performance (Parents & F₂'s) in different environmental conditions