1. INTRODUCTION

Sesame (*Sesamum indicum* L.), family *Pedaliaceae*, chromosome number 2n=26, commonly known as til, ellu, beniseed, simsim in India. Its one of the important edible oilseeds cultivated in India since ancient times.

Sesame is called as ‘queen of oilseeds’ in view of its oil (38-54%) and protein (18-20%) contents of high quality and nearly 73% of the oil is used for edible purposes and preferred for cooking due to zero cholesterol, 8.3% for hydrogenization and 4.2% for industrial purposes in the manufacture of paints, pharmaceuticals and insecticides because of its stability, anti-bacterial, anti-viral, anti-fungal and anti-oxidant properties. White seeded sesame is extensively used in bakery products, whereas black seeded sesame used for medicinal purposes. The oil cake is an edible cake and used as cattle feed and as ingredient up to 5% in well formulated poultry feeds. Cake also used as farm manure and contains 6.0-6.2% N, 2.0-2.2% P2O5 and 1.0-1.2% of potash.

The origin of sesame was uncertain earlier, however considered to be originated in Africa and later spread to West Asia to India, China and Japan. The cultivated sesame originated in India as in wild form (black seeded) and its being used in religious function as mentioned in Sanskrit, afterwards spread to Mesopotamia and then to Babylonia, Egypt, China, Greece etc. The genus *Sesamum* consists of 35 recognized species, *S. indicum* L. is cultivated, whereas other 6 partially cultivated species include *S. radiatum* (India, Africa, Sri Lanka), *S. angustifolium* (Congo, Mozambique, Uganda), *S. occidentale* (Africa, Sri Lanka, India), *S. calycinum* (Angola, Mozambique) and *S. bauymii* (Angola); remaining species are in wild form and mostly found in tropical African countries, however nine wild species have been found in peninsular India.

Sesame is cultivated in both tropical and subtropical areas on 6.5 mha area, producing over 3 mt of seed, however India, Sudan, Myanmar, Medico and China accounts for 68% of world production and India.
accounts for nearly 39% area (1.94 mha), 27% production (0.755 mt) and 40% export of world’s (Anon., 2012). Similarly, anticipating higher domestic production of sesame seed in 2012/13, exports are likely to grow 6 percent to 450,000 tons. South Korea is the largest importer of Indian sesame seeds followed by Vietnam, United States, China and Turkey.

In India, its cultivation is mostly confined to Uttar Pradesh, Rajasthan, Madhya Pradesh, Andhra Pradesh, Orissa, Gujarat, Tamil Nadu and Karnataka. In the eastern parts i.e. West Bengal, Orissa, Assam and Andhra Pradesh both red and black seeded sesame are grown, while in Gujarat and other western states, only white seeded sesame is grown. In Maharashtra state, sesame cultivated on 0.52 lakh ha area with production of 0.08 lakh tons and productivity of 160 kg/ha (Anon., 2011). Sesame is cultivated in all seasons (kharif, semi-rabi, rabi and summer) either single crop or multiple crops in year.

However, in India productivity is very low (338.6 kg/ha) in comparison to the world’s average productivity (446.6 kg/ha) and it’s much lower than Egypt (1250.3 kg/ha) and China (1221.5 kg/ha) (FAO, 2010). In India, the productivity is very low particularly in Maharashtra. The major reasons for low productivity are cultivation in marginal/sub-marginal lands under poor management along with input starvation in rainfed situation. The production also showed wide fluctuation due to high sensitivity of this crop to the changes in environments, distribution and amount of rainfall, temperature and photoperiod.

In India, sesame improvement initiated as early as 1930’s and so far large numbers of varieties have been developed for different agro-climatic situations, however there exist perceptible gap between realizable potential and actual production. Sesame breeding continues to be in traditional and classical way and most of the varieties are derived either by pure line selection or from single crosses by pedigree breeding method. These methods resulted in low variability and marginal increase in seed yield and oil yield and poor adaption over diverse agro-climatic regions due to narrow
genetic base. Hence, reselection from multiple combinations using diverse parents is essential to identify genotypes suitable for wide range of agro ecological regions.

Heterosis is already well-known in many cross pollinated and in few self pollinated crops like tomato. In sesame, Pal (1945) was first to report heterotic effects, subsequently number of workers have reported relative heterosis and specific combinations of parents for presence of high hybrid vigor, which was reviewed by Osman (1985). Sesame has distinct advantage in development of hybrids due to often cross-pollination up to 50%, low seed rate (2.0-2.5 kg/ha), high seed multiplication ratio (1:150) and epipetalous floral structure enabling easy emasculation. Therefore heterosis breeding could be new hope for increasing the productivity in sesame.

However, success of hybridization depends on the extent of heterosis for seed yield and its component characters, identification of good combining parents of diverse origin, high specific combining ability for exploitation of heterosis, gene action governing the character and cost effective technique to produce hybrid seeds. Besides yield potential, yield stability over a range of environment is of major concern, affecting the spread of the variety, productivity and total production of the crop. Several authors reported high genotype x environment (G x E) interaction for seed yield and also observed large gap in the heterosis in experimental hybrids at a single location or two locations and their average performance in multi-location trials at larger plots. Hybrid seeds production through emasculation and hand pollination is cumbersome and cost intensive. Thus, in the absence of male sterile lines the practical possibility for commercial exploitation of heterosis is far reaching due to high cost of F_1 seeds. The work on development of cytoplasmic male sterile (CMS) lines through inter-specific hybridization of *Sesamum malbaricum* (wild) x *S. indicum* (cultivated) types was initiated at Vrindachalam center, AICRP on Sesame and Niger, however so far there was no appreciable successes in
development of stable A, B and R lines. In absence of stable CMS lines, the
cost of hybrid seed could be reduced through the exploitation of residual
heterosis in F₂ generations of crosses with high heterosis and negative
inbreeding depression. F₂’s with substantial heterosis over F₁ mean or
existing locally adapted variety could be utilized for cultivation. Hence, the
present investigation was undertaken with following objectives.

1. To study the extent of heterosis for seed yield and yield
   contributing characters
2. To study the combining ability of the parents and their behaviour
   in combinations to produce hybrids with high specific combining
   ability effects for quantitative traits
3. To know the nature of gene action governing the quantitative
   traits
4. To study G x E interactions and stability of genotypes for
   quantitative traits
5. To study inbreeding depression in F₂ generation for quantitative
   traits
6. To study technique and cost of hybrid seed production