1. INTRODUCTION

Lentil \(\textit{Lens culinaris} \) (Medik.) is one of the oldest leguminous crops believed to the indigenous to southwestern Asia and the Mediterranean region. From these areas it spread northward to Europe, eastward to India. China and southward to Ethiopia. Lentil has been esteemed as a food since biblical times and formed a common food of the ancient Greeks, Jews, Egyptians and Romans. Lentil is found with field pea and horse bean in the earliest agricultural sites in the Near East. The occurrence of archaeological remains of lentil dated back 7500 to 6500 B.C., have been reported from Hacilar, Beidha and Jarmo (Helbæk, 1966). Likewise seeds of lentil have been recorded from Neolithic deposits in Greece (Renfrew, 1966).

Because of its high adaptability, lentil is now widely cultivated in temperate and sub-tropical climates and also in the tropics at higher elevations. Among pulses, lentil is next to lathyrus which has the capabilities to sustain moisture stress.

The Latin name of lentil, \textit{Lens culinaris} was first time published by Medikus in 1787. According to Barulina (1930) this species has been divided into two sub species i.e. macrosperma and microsperma. Macrosperma produces large pods containing large seeds with 100 seed weight of 1.6 g. Mostly the cotyledon colour is yellow and testa is brown to pale green in this group. The testa remain free of any mottling.
pattern. The second sub-species known as microsperma and characterized with small pods having small and round seeds with 2-4 g weight of 100 seeds. The cotyledon colour may be orange, yellow and green. Testa may also be of different colours: viz., brown, pale yellow, green and black with different seed coat patterns.

Lentil is known to be the most nutritious of all pulses. The seeds have high protein content and are more digestible than animal protein. The split seeds are used chiefly for the preparation of soup and porridge and consumed as dal in Indian subcontinent. Being tasty and nutritious lentil soup has became popular dish in many parts of the world like United States, Europe, Australia etc. The green crop, dried leaves and stalk, empty pods and broken pieces of dal are used as cattle feed.

Lentil is grown as a rabi or winter crop in India and sown from October to November. It can be grown on a wide range of soil from light loams to black cotton soils and can stand even less fertile, moderately alkaline soils and rainfed conditions. The crop matures between 90 to 120 days. It is mostly grown in the northern plains, central and eastern parts of India including the states like Uttar Pradesh, Uttarakhand, Madhya Pradesh, Bihar and West Bengal. *Macrosparma* subspecies is widely grown in most of Madhya Pradesh and some areas of northern plains. *Microsperma* is a first choice in rest of the lentil growing regions. The total production is 1.05 million tons from an area of 1.44 million hectare and with average yield of 750 kg/ha (FAO 2001).

The average composition of lentil seeds consists carbohydrates,
59.7 per cent protein 25.1 per cent, fat 0.7 per cent, minerals 2.1 per cent and moisture 12.4 per cent.

In spite of the important place of this crop among pulses, little attention has been paid to improve the yield potential of this crop. It remained highly neglected crop till recently in terms of genetic research. Even morphological markers have not been identified in sufficient number which are necessary to initiate any meaningful programme of chromosome mapping. It is only the most crucial factor for comparative slow progress in lentil breeding. It is well recognized fact that the knowledge of the genetics of any crop plant forms the backbone of its improvement programme. However, sporadic reports on inheritance of morphological markers have been confined to analysis of dominance-recessive relationships. Information on linkage between established genes and their association with specific chromosomes is virtually nonexistent. The distribution of genes controlling morphological and economic traits over the seven linkage groups is yet to be established (Emami, 1996).

Even in the absence of sufficient information on linkage map of lentil, based on conspicuous morphological markers, work has been initiated on molecular mapping using isozymes and RFLP markers. Zamir and Ladizinski (1984) identified two linkage groups for allozymes of \textit{Got}_{1}, \textit{Mc}, \textit{Gs} and \textit{Got}_{2}-\textit{Adh}_{1}. Tahir \textit{et al.} (1993) published a list of 21 morphological markers and 91 polymorphic isozymes and RFLP markers in lentil.

Genetic maps of agricultural crops are a valuable tool for plant geneticists and breeders. Genetic maps can help in manifestation of
breeding programmes to improve the yield efficiency of any crop. It can also be useful in tagging the single gene such as disease resistance by association with morphological markers. Tight linkage of a marker to a gene(s) conferring resistance can be exploited for indirect selection of resistant plants in segregating population instead of screening for resistance. Selection in the segregating population can be based on morphological markers.

To make the beginning in mapping of a crop, it is essential to identify and analyse genetically, the maximum morphological markers in order to develop the comprehensive linkage map.

Keeping in view the above considerations the present investigation was initiated with the following objectives.

1. To determine the mode of inheritance of morphological traits.
2. To identify different linkage groups between the morphological markers.
3. To develop a genetic linkage map in lentil.