1. INTRODUCTION

The pepper species (*Capsicum annuum* L; 2n = 2x = 24) are important group of fruit vegetables and are ranked as second among important vegetable crops in the Solanaceae family after tomato (Bosland et al. 1996). Bell pepper (*Capsicum annuum* L. var. *grossem* Sendt.) also known as sweet pepper, green pepper, vegetable paprika or *Shimla mirch* is grown worldwide for its delicate taste, pleasant flavour and colour and is also the most leading crop under protected structures. Bell pepper fruits are generally blocky, square, thick fleshed, three to four lobed and non-pungent. Capsicum is native to Mexico with centre of diversity in South America (Gonzalez and Bosland 1991). Its fruits contain appreciable quantities of vitamin C (ascorbic acid), provitamin A (β-carotene) and other carotenoid pigments such as lycopene and zeaxanthin which are beneficial for prevention of cancer and cardiovascular human diseases (Ghasemnezhad et al. 2011). The pharmaceutical use of capsaicinoids is attributed to its antioxidant, anticancer, antiarthritic and analgesic properties. Globally, it occupies an area of 18, 37,704 hectares with the production of 2, 96, 01,175 tonnes (Anonymous 2011a).

In India, bell pepper was first introduced by the Britishers in the 19th century in Shimla hills and is commercially grown in Himachal Pradesh, Jammu and Kashmir, Uttrakhand, Arunachal Pradesh and Darjeeling district of West Bengal during summer-rainy months and as an autumn-winter crop in Maharashtra, Karnataka, Tamil Nadu and Bihar. In India, it is cultivated over an area of 7, 92, 100 hectares with the production of 12, 23, 400 tonnes including hot pepper (Anonymous 2011b).

In Himachal Pradesh, bell pepper occupies an area of 2,136 hectares with production of 32,092 tonnes (Anonymous 2011c). It holds a very coveted position as a leading off-season vegetable by generating cash revenues to the farmers by selling the produce in the neighbouring states and metropolitan cities. It is extensively grown as cash crop (June-October) in zone I, zone II and zone III in open environment.

The yield potential and total production of capsicum is low due to the poor yielding varieties and high incidence of the diseases and pests. Of course, bacterial wilt caused by *Ralstonia solanacearum* has assumed alarming proportions in some specific
pockets of low and mid hills of the state, especially during hot and humid weather conditions and has become a limiting factor in its commercial cultivation. Aggarwal et al. (2006) studied prevalence of bacterial wilt of solanaceous vegetables in Himachal Pradesh and reported maximum wilt incidence in Mandi district followed by Kangra, Kullu, Hamirpur and Solan which are major vegetables producing areas in the state including bell pepper. The endemic nature of bacterial wilt in the state has resulted into farmers preference for non-solanaceous crops due to severe attack of pathogen.

The disease has been extensively studied in tomato, eggplant and potato however, studies on bacterial wilt of pepper are rather limited (Mimura and Yoshikawa 2009). Because of the soil-borne nature of the pathogen, conventional management strategies of bacterial wilt like crop rotation, adjusting the date of planting, cultural methods and soil treatment are not effective. Recently, biological control has been investigated, but is still in early development stage. Therefore, breeding for resistant varieties has been reported to be most effective and practical method to control the disease (Lebeau et al. 2011). Further, due to complex nature of the resistant varieties bred for one area frequently do not sustain resistance when introduced elsewhere. Besides, strong host × pathogen × environment interaction, are the cause of failure to achieve stable resistance (Osiru et al. 2001). The available bell pepper cultivars in Himachal Pradesh are highly susceptible to bacterial wilt. Genotypes reported to be resistant at AVRDC, Taiwan and other states of India either lack in desirable horticultural attributes or succumb under new environment. Hence, it is not feasible to recommend the resistant strains as such for commercial cultivation in the state.

Thus, the incorporation of resistance into commercially important cultivars remains the most economical and durable alternative. As regards the genetics of bacterial wilt resistance, there are variable reports available in the literature depending upon the source of resistance and the progenies studied to arrive at the conclusion. Moreover, there are only a few reports on inheritance of resistance to R. solanacearum in capiscum.

The choice of appropriate breeding method for enhancing the yield potential through component traits largely depends upon the information on the nature and magnitude of gene effects present in the populations. Although diallel and line × tester analysis have been used the most but they do not provide the estimates of non-allelic
interactions. Generation mean analysis, besides providing estimates of main gene effects (additive and non-additive) also provide estimates of non-allelic (digenic) interactions \textit{viz.}, additive $\times$ additive [$i$], additive $\times$ dominance [$j$] and dominance $\times$ dominance [$l$] cross-wise (Jadhav and Dhumal 1994). This helps in the proper understanding and selection of potential parents or crosses for the pedigree selection or heterosis exploitation. There are only a few studies on generation mean analysis in bell pepper reported in literature.

Hence, the present investigation was planned and executed by involving the potential parental lines as per the procedure for generation mean analysis with the following objectives:

1. To gather information on gene action for fruit yield and component traits
2. To develop breeding material for selecting bacterial wilt resistant and horticulturally desirable progenies in the segregating generations