Introduction

Capsicum has been known since the beginning of civilization in the Western Hemisphere. It has been a part of the human diet since 7500 BC (MacNeish 1964). Capsicum is also known with a number of other terminologies like pepper, bell pepper, sweet pepper, chili, chile, chilli, aji, paprika etc. Capsicum (Capsicum annum L.) generally refers to non-pungent blocky chillies belonging to the family solanaceae. Though the tropical South America especially Brazil is thought to be the original home of peppers (Shoemaker and Teskey, 1935) it is widely grown in the tropics, sub-tropics and warmer temperate regions of the world. The Portugese brought peppers from Brazil to India prior to 1885.

Subsistence agriculture is the main occupation of the populace of Himalayan region, which is mainly based upon the centuries old practices and carried out on the narrow patches of terraced fields. The possibility for further expansion and modernization of agriculture is considerably low because of fragility and steepness of the landscape. Furthermore, the viability of outcome from the subsistence crops in the form of production and productivity is tremendously low. Meanwhile, the agro-ecological conditions are quite feasible for achieving food security through cultivating cash generating crops such as fruits of various kind off-season vegetables; potato, onion, capsicum, tomato, garlic, ginger, turmeric, spinach, beans and many other green leaves vegetables and herbs. Cultivating these crops restores environment and pave a way for food security. Cash generating crops getting its footings slowly but steady as the agro-ecological conditions of the region have the potentials for cultivating these crops. (Sati, 2008)
Capsicum is mainly grown in Himachal Pradesh, hilly areas of Uttarakhand and Karnataka. The most commonly grown variety in the region is “California Wonder”, which is an open pollinated variety. In India, it is grown in an area of 4783 ha with annual productivity of 8.83 t/ha (Sidhu, 2002). Being a crop of the tropical and sub-tropical regions it requires a warm and humid climate. This crop can tolerate extremes of climate better than tomato and brinjal. It is particularly sensitive to cold and growth is inhibited below 10°C. In general the capsicum plants require a temperature of 20°C to 25°C. Unfavourable temperature and inadequate water supply are the basic reasons for bud blossom and fruit drops. It is a day neutral crop and it comes to flower sooner in short days rather than in long days.

Capsicum is considered as a high value crop because of its high nutritive value and versatile uses. It is rich in vitamins even more than tomatoes, especially Vitamin A and C. It has got an excellent prospect both for the domestic and export market. It has a very good potential as a greenhouse crop because it fetches high price in the market. Demand of capsicum is increasing due to burgeoning population and rising per capita income. To meet the growing demand, productivity of the crop has to be increased substantially, for which greenhouse cultivation would be one of the strongest option, in view of its very specific climatic requirement.

Of late, the hilly areas have assumed great significance as the Himalayan hills range over a length of about 3,200 km with a width range of 80 to 320 km, which is about 15 percent area and 5% population of the country (Negi, 1963). The hilly areas mostly have short seasons, therefore vegetables especially off season, being short duration can get well fitted in the cropping system. Moreover it will give higher tonnage
per unit area as compared to cereals, pulses and oilseed crops, beside better food value. The mid-hills in NW Himalayas experience fluctuating weather conditions, which adversely affects crop yield and product quality. Therefore, traditional agriculture is not economical for hill areas because not only they are the low yielders but also takes a longer time to mature. Productivity and quality can be significantly improved by resorting to plasticulture, since this technology ensures near optimum growing conditions for growth and development of high value crops (Natarajan 2005). Many cropping sequences including capsicum in them were found remunerative in mid-hills of Western Himalayas (Pathania et al., 2005). Though polyhouse cultivation comes as a rescue from the deleterious weather situations, the productivity of crop is highly influenced by vital resources such as growing media. Use of bio fertilizers in vegetables enables the production of superior quality produce devoid of toxic residues. Since capsicum is mostly consumed fresh or only partially cooked, it should be free from the residual effects of chemical fertilizers. Moreover, organically grown crops are preferred for their flavour, taste, nutritive value and extended shelf life. (Meerabai, 2007).

Growing media plays an important role in successful cultivation of any crop. It should have a property of good water holding capacity and also able to drain excess water to come to field capacity which creates congenial root environment. For proper plant growth, organic fertilizers such as farmyard manure and vermicompost etc. provide consistently all essential nutrients, be it macro or micro, in an adequate quantity resulting in healthy growth of the plants. The more incorporation of organic matters in the media are expected to improve the physical structure of the soil, enhance the population of micro-organisms and increase the potential availability of growth influencing substances.
Thus the media should have a proper proportion of sand, soil and organic matter in it (Hartman and Kester et. al. 1993; Kumar and Kohli 2005), but very meager systematic study regarding this has been reported. Depth of the media should also be kept in consideration keeping in view the root growth of the crops and economics of production.

Crop geometry also has immense effect on all the growth and yield characters (Srivastava, et al. 2005). Proper spacing results in higher yield (Llaven et al. 2008). There is a direct relationship between spacing of crop on yield attributing characters such as number of branches, number of fruits, fruit size and yield etc. The closer spacing in general results in higher yield but reduces fruit size. It also has a marked influence on the quality characters of the fruit and seed (Mantur et al. 2005). Greenhouse sweet pepper is a relatively new crop in the mid hills of North West Himalayas with potential to expand production in the future. Local environmental conditions, seasonality, as well as the type of greenhouse structure used for growing may result in particular recommendations regarding crop management practices as growing media and plant density, that are different from studies reported from other countries or other regions of India. Therefore in order to boost production and productivity there is need for more research work with respect to agronomic practices of capsicum under protected cultivation. Growing media and spacing, being two of the major factors in cultivating capsicum, need more attention for better and profitable yields.

Keeping in view the above considerations a field experiment entitled “Studies on the effect of growing media and crop geometry on growth, yield and quality of capsicum in North West Himalaya” is planned with the following objectives.
OBJECTIVES:

(1) To study the effect of different growing media on growth, yield and quality of capsicum under protected condition.

(2) To study the effect of different crop geometry on growth, yield and quality of capsicum under protected condition.

(3) To study the interaction, if any, between growing media and plant geometry on growth, yield and quality of capsicum under protected conditions.