INTRODUCTION

Owing to the fast and over increasing population in the East and more so in India, the food and fodder shortage is the most acute problem which threatens the existence of humanity on this part of the globe. As such, it deserves the attention of both the public and the scientists alike to tackle it. 'Grow More Food' is the slogan of the day and from the President down to the cultivator in the field, everybody is convinced that increased food production is the panacea for all the economic ills in this country.

Cereals form the staple food of the masses, but their production cannot be increased so as to keep pace with the regular and rapid increase in population. If a satisfactory solution is to be found, the land-use policy will have to be drastically changed by diverting more area to such crops as tubers and vegetables in case of which the food produced per unit area is several times that of cereals. The Nutrition Advisory Committee (1944) placed a special emphasis on increased vegetable production as a part of the 'Grow More Food Campaign'. According to Aykroyd (1938), the Indian diets, in general, are defective because they do not contain protective foods like vegetables, fruits and milk.

The carrot, Daucus carota L., by virtue of its short growth period; tolerance of wide ranges in soil moisture and fertility; relatively less susceptibility to insect pests and diseases; good yielding potential and high nutritive value can play an important role in the drive for increasing food production. It is one of the crops that yield the most in food value at the lowest cost. According to MacGillivray et al. (1944), it ranks second amongst the four groups
of crops arranged by them in the order of merit on the basis of their food production efficiency data. Carrot is one of the major root vegetables and ranks first as an important umbelliferous vegetable seed crops of the world (Hawthorn and Pollard, 1954). It is very popular in Northern India and particularly in the Punjab state.

Besides good tonnage capacity, the root is esteemed most for its many virtues. It has an outstanding nutritional value due to its carotene content, the precursor of vitamin A. The root contains 82.2 per cent water and the food value per 100 grams of edible portion is: energy, 45 calories; protein, 1.2 g; calcium, 42 mg; vitamin A, 12,000 I.U.; ascorbic acid, 4 mg; thiamin, 0.042 mg; riboflavin, 0.043 mg; and niacin, 0.21 mg (MacGillivray, 1961). The root supplies more food energy, carbohydrates, vitamin A, thiamin and potassium than other root vegetables, that is, beet, turnip and radish (Sherman, 1941). It also ranks first in average total yield per acre and production of food constituents such as protein, calcium, iron, vitamin B and G (MacGillivray et al. 1942).

As an article of diet, the root finds favour in several culinary preparations. Besides being taken raw, it is also utilized in the production of finished products such as pickles, preserves and sweetmeats. A cold beverage "Kanji" is prepared from both the yellow and red coloured carrots. In less familiar roles, it is used in salads, sandwiches, or for sweetening puddings. Dried carrot meal has a pleasant sweet taste. With the present scarcity of oranges, the inclusion of a moderate proportion of carrot in marmalade has been suggested.

Several medicinal qualities are attributed to carrot, such as a cooling effect on the body and a strengthening effect on the heart and brain. It also acts as expectorant diuretic and is good for liver. It is very good appetizer and being a stomach tonic is recommended in diarrhoea.
The carrot is available in plenty in most time and can be introduced into the diet in several ways. It might not be too much to expect the carrot to provide half the total carotene requirement over the whole year, with an allowance of about 25 grams per head of the population per day. At this level, the place occupied by the carrot in the menu has to be even more important.

In view of its economic importance and as a result of renewed fillip given to the vegetable production during the present Five Year Plans, the area under carrot in Punjab is expanding rapidly and most of this is concentrated in the central region. Still, the root production potential per unit is rather low. The seed supply position is also unsatisfactory and the prices of good quality seed are unusually high. Evidently, there is a dire necessity of the formulation of such a programme as could bring about a sizable increase in the yielding capacity and quality of both the root and seed crops, since the root production forms the important basis for augmenting the supply of fresh vegetable, while the seed is the basis of the crop that eventually is to be harvested.

The use of good quality seed, the balanced nutrient supply and optimum spacing are universally recognized to be the principal factors which have a profound influence on the yielding capacity of a crop. Although some attention has been paid to the needs of major nutrients of carrot roots, no fundamental study concerning the other agronomic aspects of both the root and seed crops has ever been made in this country.

The present studies were, therefore, an attempt to systematically investigate the part played by these factors in improving the yielding capacity and quality of the root and the seed crops. More specifically the objectives were:

1. to determine the major and micronutrient element needs of carrot root;

2. to investigate the influence of large and small carrot seed harvested at two stages of maturity upon the resulting crop;
3. to evaluate the direct effects and to measure the residues of micro-
   nutrients in stocklings for producing carrot seed; and finally

4. to find out the optimum spacing and rates of N, P and K fertilization
   for seed production.

The success that attended the venture and the lessons learnt are reported
in the text. It is believed that the knowledge gained would be of value to
nutritionists, agronomists and vegetable growers engaged in or contemplating
carrot production.