

CHAPTER I

INTRODUCTION

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Spices are high value and export oriented commodity crops, which play an important role in agricultural economy of the country. India is the principal source for supply of spices in the global market, though there are number of other countries like Indonesia, Malaysia, Pakistan, Australia, Spain, Egypt and Tanzania are producing and exporting spices to the international market. Spices contributed 1.24 per cent of India's total export earning. The share of spices in the export earnings from agricultural and allied products is 8.5%. The north-eastern region comprising of states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura has tremendous potential for production of spice crops. The climatic condition of the region is highly suitable for cultivation of a large number of spices such as ginger, turmeric, chilli, tejpat, large cardamom, coriander, and garlic. Though recently introduced, the region has a potential for commercial cultivation of black pepper, cumin, vanilla and saffron. Among all spices, ginger (*Zingiber officinale* Rosc.) is the main cash crop supporting the livelihood and improving the economic level of many ginger growers of north eastern region. Ginger is grown in almost all the states of the region but the leading states are Meghalaya, Mizoram, Arunachal Pradesh and Sikkim (Govind *et al.*, 1998). Apart from improved varieties like Nadia, China, Varada, a number of local cultivars exist in north eastern region. These varieties are high yielder of rhizomes as compared to standard cultivars like Nadia and Rio-De-Janeiro but have more fibre content (Yadav *et al.*, 2004). Ginger a rhizomatous crop belonging to the family 'Zingiberaceae' is an aromatic spice crop of the world. It is a valuable cash crop in India and plays an important role in the national economy. Ginger is a native plant to Southeast Asia. However, at the present time, it is cultivated throughout the tropical regions of the world and is no longer thought of as just an Asian herb.

The underground stem known as rhizome is the most important economic part of the plant and it is extensively used for commercial as well as domestic purposes. Ginger is used as fresh and processed products like dried ginger, ginger powder, essential oil, oleoresins and also as beverage. The

rhizomes are utilized widely as spices in cooking for flavor and taste, for pickles, candies etc. The freshly harvested ginger is used for consumption as green ginger in whole northeastern states. Little amount of surplus is sold outside the region through middlemen at a very low prices. Sometimes due to marketing problem the farmers are not able to sell their produce since there is no local market big enough to absorb and handle green ginger in large quantities. Therefore, it is essential to convert a part of produce into low volume high value ginger to make the crop remunerative. As it is abundantly available in the region, different products like ginger oil, ginger oleoresin can be prepared for export, which are very common in developed countries. Dried ginger (called *Saunth*) can also be prepared and it may be either sold as such or in the form of an off white to very light brown powder. The dried ginger or ginger powder is generally used in manufacturing of ginger brandy, wine and beer in many western countries. Ginger oil is primarily used as a flavouring agent in confectionary and for soft drinks. The ginger is also used for several medicinal purposes.

Ginger requires a tropical, sub-tropical or humid climate for its commercial production. It can be grown successfully to an altitude of 1500 m from MSL. It is usually grown as rainfed crop with moderate to heavy rainfall of 1500-3000 mm, well distributed in 8-10 months. The crop is sensitive to water logging, frost and salinity and tolerant to wind and drought. Partial shade is recommended in certain places where temperature is high. It thrives on a wide variety of soil but for higher yield it prefers good garden soil rich in humus, light, loose, friable, well drained and of at least 30cm depth. The rhizome growth is better on slightly acidic soil with a pH range of 6.0-6.5.

The area under ginger in N E Region is 33.2 thousands ha which gives total production of 191 thousand tonnes at an average yield of 5.8 t ha⁻¹ against the national productivity of 3.5 t ha⁻¹ (Anonymous, 2002). Assam, Meghalaya, Mizoram and Arunachal Pradesh are major ginger producing states in the region (Rahman *et al.*, 2009). Assam is also second largest producer in the country with total share of 19.6 % after Kerala, which contributes 23.1 % to the total production of the country. However, the productivity is highest in Mizoram (8.40 t ha⁻¹) followed by Arunachal Pradesh (7.39 t ha⁻¹), Assam and Nagaland (6.99 t ha⁻¹). This shows that farmers are

interested for the cultivation of ginger as soil, climate and other ecological factors favour the growth and development of the crop and there is a tremendous scope to increase the yield per unit area and thereby the total production of ginger in North East Region. In Manipur, it is cultivated over an area of 2.14 thousand hectare with a production of 3.53 thousand tonnes (Anonymous, 2002) with an average productivity of 1.65 t ha^{-1} which is quite below the national average of 3.5 t ha^{-1} . The prominent reasons for low productivity are non availability of good quality, high yielding and disease resistance promising variety and poor nutrient management practices.

This region can be considered as treasure house of ginger germplasm. There are several cultivated types of ginger available in the region, which are generally named after the localities they are being grown. Certain indigenous types namely '*Maran*' and '*Jorhat Local*' of Assam have been reported to be equally good in rhizome yield. Dry ginger recovery of these varieties has been found to be even better than exotic type '*Rio-de-Janeiro*'. In Arunachal Pradesh, '*Basar Local*' is very much popular due to high yield and its adaptability to the area. In Mizoram, local types '*Thingpui*' and '*Thinglaidon*' are grown at large scale. The variety '*Nadia*' is very much popular among all the states of North Eastern Region due to its low fibre content though it has low productivity (Borthakur, 1992). In Meghalaya, in addition to local types namely '*Khasi Local*' and '*Tura Local*', considerable area has been brought under selected type '*Nadia*'. Black ginger having rhizomes with bluish black tinge inside is reported to have medicinal properties and is grown by the inhabitants of Mizoram just for their own use. It is also said to be sold at very high price probably due to high medicinal value. In Tripura, '*Tripura Local*' performed better in comparison to the other types. In Manipur, '*Thingpui*' is commonly preferred in the hills. In Nagaland, a variety having very high pungency but smaller in size is commonly grown by the tribal. Another type of ginger having rhizome with pinkish tinge inside is also found in the state. In Sikkim local types '*Bhaise*' and '*Gorubathan*' are grown commercially due to their high yield potential and big size rhizomes (Yadav *et. al.*, 2004).

Ginger being heavy feeder and exhaustive crop requires large quantities of manures and fertilizers. Inorganic fertilizer besides being costly is causing problems to the ground water and environment as well as quality of

the produce. Majority of the farmers in the region cannot afford the cost of fertilizer involved in commercial ginger production. The ginger production in the north eastern region is organic by default because the farmers of the region neither apply the chemical fertilizers nor chemical pesticides in ginger crop. They are only applying the locally available farmyard manures (cow dung manure, pig manure, poultry manure and rabbit manure) in whole North Eastern Region. In this way, the ignorance of the farmers about the technological advances is turning out to be a key to prosperity. Considering the increasing demand for organic produce all over the world, the farmers can definitely hope to get better returns for their produce. Organic farming has attracted increasing attention among our environmental protection, improved quality and reorientation of agriculture towards areas of market demands. However, ginger cultivated with only organic manures though improved quality parameters of the produce, but was inadequate for obtaining high productivity. In recent years, biofertilizers have emerged as promising component of nutrient supply system. Use of biofertilizers in organic ginger may further enhance its productivity by supplying plant nutrients as per the need of the crop through greater mineralization due to higher microbial activities. Therefore, there is lot of scope to popularize the organic ginger production for export in foreign country from the region and establish organic product based ginger industry in the region.

But information in details about the availability of good quality high yielding variety and use of different biofertilizers are very limited particularly in ginger. Keeping this idea in view and considering the importance of the problems, an effort has been made to study the growth and productivity of ginger (*Zingiber officinale* Rosc.) as influenced by crop variety and biofertilizer at the Horticulture Experimental Farm, College of Agriculture, Central Agricultural University, Imphal, Manipur with the following objectives:

- 1) To identify the promising variety of ginger in respect of growth and rhizome productivity.
- 2) To study the effect of biofertilizer on the growth and productivity and quality of ginger.
- 3) To estimate the nutrient uptake and fertility status of the soil at different biofertilizer treatments.
- 4) To study the economics of ginger cultivation as influenced by biofertilizer treatments.