CHAPTER 1

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The backbone of Indian economy is agriculture and 66 percent of the total population is engaged in agriculture. Agriculture is centre stage in world interdependence. An adequate supply of food is the major need in many developing countries. Agriculture sector accounts 22.2% in the National Gross Domestic Product of India during 2002-2003. Ever its share was 55.40 in 1950-1951 and 26.1% in 2001-2002. Share of agriculture in GDP began to decline. After independence spectacular progress has been achieved in agriculture production in the country. Ever increasing population of the country now has become a great problem and increased food production is insufficient for self-reliance in food security. In this regard, vegetable has a significant value because of the predominance of vegetarian diet of the majority of people. Vegetable cultivation is not only remunerative but also highly nutritive and serves as cheaper source of protective food. Vegetables have a number of medicinal properties too. Fresh vegetables are useful in the prevention of stomach diseases diabetes, worms,
skin diseases, cancer and blood purification etc. Vegetables are rich in anti-oxidants which protect us by destroying the fresh radicals in our body mainly responsible for coronary heart diseases, cancer and ageing. Around 285 g vegetables per capita per day have been recommended by nutritionists for a balance diet, however, only about 135 g vegetables are available per capita per day in our country. Under this situation, it becomes necessary to give greater emphasis on vegetable production and protection from pests.

In India, vegetables are cultivated in around 6 million hectares of land with annual production of 90 million tonnes offering second rank next only to China. The vegetable production of our country was very low, less than 20 million tonnes during 1947 at the time of Independence. Interestingly during the last decade, the increase in the area under vegetable crops was mainly 0.42 per cent while production has increased by 78.91 per cent. However, as the country's population is increasing @1.8 per cent, our vegetable requirement upto 2010 will be around 135 million tonnes.

In the wake of high production of vegetable, farmers applied excess doses of chemical fertilizers, pesticides which
enhanced the population of harmful plant parasitic pathogen *vix.* bacteria, fungi, nematode into soil causing great losses. Recently vegetable growing areas have been infested with nematodes. Farmers are not able to achieve their proper return from vegetable production. The most common plant parasitic nematode causing loss to vegetable crops are root-lesion nematode- *Pratylenchus* spp., *Ditylenchus* spp. stunt nematode-*Tylenchorhynchus* spp., cyst nematode-*Heterodera* spp. lesion nematode, stem root-knot nematode-*Meloidogyne* spp. are very much common in vegetable producing areas, now it has been menace to every vegetable crop. The per cent losses due to root-knot nematode (*Meloidogyne* spp.) ranges from 28-47.5% in tomato, 26.2 to 50% in brinjal, 60 to 80% in okra. Damage to crops by nematode are often ignored or attributed to other course such as lack of nutrients, deficient soil moisture or soil exhaustion partly because they were too small for visual perception and partly due to lack of definite information on the their occurrence and pathogenicity.

Due to ignorance of farmers about the root-knot nematode disease, it is increasing by leaps and bounds and decreasing vegetable production in a very fast manner, mounting pres-
sure of increasing population and shrinking land resources has necessitated the production of increasingly more food per unit area. Insects pests and weeds are important biotic constraints inflicting 20-25% loss in agriculture production. Synthetic pesticides have played a very significant role in restricting many pest problems, however their indiscriminate use has taken its toll by creating several problems like pesticide resistant insects, pests, contamination of food by toxic residues, resurgence of pests and determine effects of non-target organism. The number of effective pesticides available is dwindling day by day further leaving less choice among which to choose. An alternative method of using botanical pesticides should be adopted due to ill effects of synthetic pesticides for plant protection. Bio-active products of plant origin being less persistent in environment and safe to mammals and other non-target organisms are readily available at many places and are cheaper than their synthetic counterpart and their crude extracts are easy to prepare even by farmers. These are less or slower to result in the development of resistance or resurgence in pests.

In recent years, the use of synthetic pesticides in crop protection programme around the world has resulted in distri-
bution of the environment pest resurgence, pest resistance to pesticides and lethal effects on non-target organisms, agro-ecosystem in addition to direct toxicity to users. Therefore, it has become necessary to search for alternative means of control which can minimize the use of these synthetic chemicals. The use of botanical pesticides/natural plant products in an agro-ecosystem is now emerging as one of the prime means to protect crop and the environment from the pesticidal pollution which is a global problem. Botanical pesticide poses important properties including insecticidal activity, toxicity to nematode, mites, another agricultural pests and also anti-fungal, antiviral and antibacterial properties against pathogens. Some of these indigenous resources have been in use for over a century to minimize losses due to pests and diseases in agricultural production (Mishra, 1998). However, plant based pesticides have many advantages over synthetic chemical pesticides which are as follows:

1. Botanical pesticides in general pose low mammalian toxicity and thus constitute percentage of no health hazard and environment pollution.

2. There is no risk of developing pest resistance to
these products when used in natural forms.

3. These cause less hazard to non-target organisms and pest-resurgence has not been reported except synthetic pyrethrins.

4. No adverse effect on plant growth, seed viability and cooking quality of seed grains.

5. Botanical pesticides are less expensive and easily available because of their natural occurrence especially in oriental countries.

Due to ever increasing demand for crop nutrient in a generally low fertility situation in vegetable accompanied by the higher cost of non-renewable chemical forms of nutrients and the concern about the environment degradation and pollution, the need for supplementary cheaper sources of nutrients is recognized organic forms of nutrients through crop residue, dung, city compost, green manuring and the use of botanical fertilizer constitute a potential renewable source of nutrient supply to crops under all situations. The interaction of chemical fertilizer with the soil is considered less favourable to the soil environment in comparison to organic sources of crop
nutrients which supply a range of nutrients including trace elements though scanty.

Several workers have studied the different aspects of control methods. Even resistant varieties have been tested against nematode infection and were moderately to highly susceptible to nematode. Chemical means of control have not been found very suitable against nematode, therefore in this study root-knot nematode infection on okra, brinjal and tomato has been managed with the use of plant based pesticides keeping following objectives

1. Assessment of losses in vegetable crops—tomato brinjal and okra due to infection of root-knot nematodes.

2. To study the role of edaphic factors for increasing nematode diseases.

3. To assess the effectiveness of botanical pesticides—Bionema, Achook, Nemani, Neemark, Nimbecidine to control the root-knot nematode problems.

4. Based on above information to recommend the botanical pesticides to control root-knot nematodes.