CHAPTER- I
INTRODUCTION

Citrus is one of the largest and most important fruits of tropical and subtropical regions. It is a native to India and South Eastern China. It occupies 3\textsuperscript{rd} ranks after mango and banana in India. It comprised two groups: Lime and Lemon. Citrus is a member of the family Rutaceae.

Limes and lemons are believed to have originated in North Eastern India, adjoining portions of Burma or Northern Malaysia and have followed the general path westward to the Mediterranean basin and thence to the western hemisphere. It is successfully grown in state of Andhra Pradesh, Maharashtra, Tamil Nadu and Madhya Pradesh. Citrus is grown in 1055.0 MT/ha with the production of 12746.0 MT having productivity 12.0 MT/ha. It occupies the highest commercial importance of all the available types of limes and lemons. Among lime is grown in 259 MT/ha with the production of 2789.0 MT having productivity 11.0 MT/ha in 2016-17 (Anonymous, 2016).

Citrus fruits contain 85-90 per cent water, 10-12 per cent sugars, 1-7 per cent citric acid and various other constituents such as vitamins, minerals, pectinacious materials etc. Citrus fruit contain 0.5-0.8 \% proteins and 0.1-0.2 \% fats. The anthocyanin pigment causes the red colour in the flesh and rind of some of the orange and grape fruit varieties. Important carotenoids present in orange and mandarins are \(\beta\)-carotene, xanthophylls, cryptoxanthin and violaxanthin. Citrus fruits are rich in vitamin C or ascorbic acid. In orange juice, vitamin C content is 50 mg/100 ml juice. Grape fruits contains slightly less vitamin C (60 mg/100 ml juice). Citrus flavonoids and limonoids have medicinal value. Citrus fruits are notable for their fragrance, partly due to essential oils which is turn are terpenes contained in the rind and juice sacs most of which are juice-laden. The juice of limes and lemons contains a high quantity of citric acid giving them their characteristics sharp flavor.

Small-fruited acid lime cv. Kagzi lime are classified botanically under \textit{Citrus aurantifolia} Swingle. Kagzi lime is mostly used as fresh fruits for the table purpose, manufacture of beverages, industrial and medicinal purpose. It is the rich source of vitamin C and also contains vitamin B, pectin, minerals and other nutritive substance
which are required for human health. Lime juice is used for scurvy diseases. They also have laxative effect on the digestive system.

Kagzi lime has great importance in Ayurveda for its useful effects on body. It is said to be an appetitiser, stomachic, anthelmintic, cures abdominal complaints, removes diseases due to “tridosha”, loss of appetite, constipation, fatigue, good in “kapha” and biliousness, abdominal pain and foul breath, relieves vomiting and good for eyes. It is also believed to be powerfully refrigerant and antiseptic.

The plants of acid lime are small and bushy having fine twigs; thorns conspicuous and sharp; flowers are small, pure white in colour, borne in clusters; fruits small to medium; pulp greenish, adherence to the skin strong; seeds small and smooth; skin yellowish green, thin or papery and shiny; juice sacs slender with solid core.

Acid lime flowers and produces fruits almost all round the year, but there are three major flushes i.e. June-July, September-October and January - February. These flushes are known as Mrig Bahar, Hast Bahar and Ambe Bahar, respectively. Fruits of Hast Bahar (September-October) harvested during summer are highly remunerative. To achieve this, irrigation should be suspended for 1 to one and half months before actual flowering. During this period field may be cultivated and applied with manure and fertilizer towards the end and irrigation be resumed.

Lime is usually propagated by seed and seed germination is slow and erratic. The possible reasons of slow germination are presence of growth inhibitors and physical resistance of seed coat to radical protrusion. There is considerable evidence that gibberellins may promote the germination of various seeds in different ways. The application of GA\textsubscript{3} at about 10-15 ppm can accelerate germination. In trifoliate orange, empress mandarin (C. reticulate) and lemon or increase the germination percentage in trifoliate orange.

The growing media is one of the important enrolment factors, which plays an important role in growth and survival of seedlings. Growing medium must retain moisture, nutrients and provide support to seedling. Organic matters are required for successful seedling raising of fruit and vegetables. Citrus thrives best in a soil with a pH slightly below the neutral point. Use of suitable growing media or substrates is essential for production of quality horticultural crops. A good growing media would provide proper anchorage or support to the plant, serves as a nutrient and water reservoir and permit gaseous exchange between roots and atmosphere. Vigorous
growth is needed to face the seasonal hazards and this is entirely based on chemical and physical characteristics of the media. Optimum water holding capacity, electrical conductivity, better aeration, and organic matter of media may help in better seedling stand and plant growth of citrus seedling.

Vermicompost increase soil organic matter and nutrient content, improves the soil structure and increase cation exchange capacity. Earth worms utilize organic wastes as food and the undigested material excreted by them has gained the name ‘vermicompost’. The vermicompost serves as organic manure, since it is a source of nutrients, such as nitrogen, phosphate, potassium and micronutrients.

Cocopeat provide excellent pore space (25-30%) and fine structure required for proper growth. It is a rich source of nutrients and can easily mix with other growing media used in growth of seed germination and seedling.

The growth substance most commonly used for better germination and rooting for various plant parts are Auxin (IAA, IBA, NAA), Gibberelic acid (GA$_3$) etc. Among these GA$_3$ has proved to be the best for proper germination and seedling growth as well as effectiveness varied according to species. A wide spread use of growth regulators by nurserymen, florist and horticulturist indicates that the growth substance are valuable aid to germination of seed and seedling growth of the plants. These is the great role of various media as well as plant growth regulators particularly GA$_3$ for seed germination as well as survival seedlings.

During seed germinations, the role of GA$_3$ in the induction of synthesis of α-amylase and other hydrolytic enzymes among monocots and certain dicots is well documented. GA$_3$ appears mainly to induce the activity of the gluconeogenic enzymes during early stages of seed germinations.

Acid lime is an important fruit crop which is propagated through seeds only. The quality of seedlings obtained from a nursery influences re-establishment in the field and the eventual productivity of an orchard. Seed germination is affected by many factors like type of substrate used, environmental factors etc. Some of the problems faced by acid lime growers are slow, erratic and incomplete germination, high initial seedling mortality and incidence of soil born diseases. In heavy soil without enough drainage, the development of root system is suppressed and plants are more susceptible to soil born diseases. The increasing germination percentage and producing healthier seedling is a major challenge for farmers. Growing media also plays an important role in seed germination and seedling growth. Hence, there is a
need to standardize the growing media with using different concentration of GA₃, which give high germination percentage and least seedling mortality.

Producing plants from seeds is most important propagation method. Seedling propagation involves careful management of seeds, seed storage period, germination conditions and knowledge of requirements of seed for germination as well as the overall growth. Less information available on this aspect hence, the present experiment on effect of growing media and GA₃ on seed germination and seedling growth of acid lime (*Citrus aurantifolia* Swingle) cv. Kagzi lime was undertaken with the following objectives,

1. To study the effect of media on seed germination and seedling growth of acid lime.
2. To study the effect of GA₃ on seed germination and seedling growth of acid lime.
3. To study the interaction effect of media and GA₃ on seed germination and seedling growth of acid lime.