INTRODUCTION
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*Cymbopogon flexuosus* (R.C.) Stapf and *Cymbopogon citratus* (R.C.) Stapf, respectively known as East Indian and west Indian lemongrass, belong to the family Gramineae (now, Poaceae). The former is available in some of the southern states of India and widely cultivated in Kerala, whereas the latter is very common and cultivated in countries like Guatemala, west Indies, Brazil, araguay, Zaire, Tanzania and Madagascar. Nowadays, some other citral yielding *Cymbopogon* species viz. *Cymbopogon khasianus* (Hack) Stapf ex Bor, *Cymbopogon pendulus* (Keos ex Steud) Wats are also gaining importance in the area of lemongrass oil.

*Cymbopogon flexuosus* is the major source of lemongrass oil in India. Normally the plant attains a height of about 210 cm - 315 cm. Leaves are linear, lanceolate, 130 x 1.7 cm in shape with a distinct midrib. The young leaves first grow erect but as the length increases the leaf canopy becomes droopy. The leaves are arranged laterally with long internodes in an acroetal succession with an acute apex. The inflorescence is a panicle and is approximately 100-135 cm in length. The spikes are unequal in size and the flowers are open (late-1).
Plate 1. Lemongrass plant in full bloom stage.
Some of the improved varieties viz. 3D-68, OF-19 and a selection IMF-0 introduced at Regional Research Laboratory, Jorhat (RRL, Jorhat) recorded their differential yield of herbs and oil quantities, but morphological variations among these high yielding varieties were not so prominent (Dutta, 1976).

Citral is the chief constituent of lemongrass oil. It is used as a starting material for preparation of alpha and beta ionones. While alpha ionone is mostly used in flavours, cosmetics and perfumes, the beta ionone, on the other hand, is widely utilised in manufacture of synthetic vitamin-A. For the last several years, the annual production of lemongrass oil in India came down to about 800 tonnes, whereas it produced about 1800 metric tonnes of this oil and exported a large quantity of it during 1963. The estimated annual world demand of lemongrass oil is approximately 2500 metric tonnes, but India's position is unlikely to improve if research and development on lemongrass is not adequately geared up to compete with the countries like Guatemala which has been maintaining its lead in the present International market.

It is gathered from available literature that in the year 1966-67, the world market refused to accept the Indian lemongrass oil on account of its lesser percentage of citral. Apart from increased production of lemongrass
oil during 1962-85, Guatemala started developing new varieties with higher percentage of citral. That is why, there was a big drop in the export demand and subsequently Indian lemongrass oil had to be disposed off at a throw away price. Consistent efforts are being made in India to develop high-yielding varieties at various Research & Development Institutions viz. Lemongrass oil Research Station, Odakal (Kerala); Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow; Regional Research Laboratory, Jorhat, Assam; (HL, Jorhat) and Regional Research Laboratory, Jamsh. In spite of such efforts, India is able to export only about 300 tonnes of oil in current years, meanwhile importing 19 tonnes of Vitamin A at a cost of Rs. 42,944, 43.00 during the year 1978-79 as included in the "Report on the Marketing of Lemongrass oil in India, 1981".

Therefore, keeping an eye on these various aspects Regional Research Laboratory, Jorhat, Assam undertook the work on introduction of lemongrass varieties in the North-East region. Field trials were in progress for last several years to find out the prospect of popularising the crop in suitable localities (HL, Jorhat Annual Report, 1977, 1978 and Jaha et al., 1981). However, all the varieties were very much susceptible to a leaf blight disease due to infection by Curvularia verruciformis Agarwal and Jahni (Barua and Bordoloi, 1983).
The extent of plant metabolic constituents such as chlorophyll, ascorbic acid, peroxidase enzyme, tannin, sugar, protein, carotene etc. in relation to host-parasite interactions was extensively elaborated by various workers (Allen, 1942; Pero and Main, 1970; Chiranjeevi and Tripathi, 1975; Upadhyay and Dwivadi, 1979; Sarwar and Khan, 1973; Gunasekaran and Weber, 1972; Prasad et al., 1976; Gangawane and Patar, 1978; Heitfuss et al., 1960; Andrev and Shaw, 1965; Jennings et al., 1969; Hislop and Stahman, 1970; Chinnadurai, 1970; Kurhut et al., 1979; Tripathi and Chiranjeevi, 1975; Gerwitz and Durbin, 1960; Krog et al., 1961; Shaw and Colotelo, 1961; Quick and Shaw, 1964; Lowell and Brahnasaan, 1968; Johnsen et al., 1968; Reutskaya, 1967 and Gangopadhyaya and Chattopadhyaya, 1976). However, except a few records, no such elaborative work on metabolic products of essential oil bearing plants which may influence the host-parasite interactions and thus cause imbalance to the normal crop physiology, effecting the yield in terms of essential oil and its quality, are available. Such imbalance of the essential oil crop not only leads to the crop loss, but it alters some of the host metabolites including the essential oils. The reduction of herb and essential oil content in Java citronella due to the attack by Curvularia eragrostidis and in Ocimum basilicum was recorded by Upadhyay et al., 1975; 1976. The loss of essential oil
due to rust disease on *Mentha piperita* was emphasised by Felklova (1978) and Darvey (1979). Similar loss of essential oil on anise, caraway and fennel due to the fungal attack by *Sclerotinia sclerotiorum* was reported by Tarabeih et al., (1980) working on three mint species, viz. *Mentha arvensis*, *Mentha spicata* and *Mentha piperita*. Bharadwaj et al., (1980) reported that herb and oil yields were reduced significantly due to fungal attack by *Rhizoctonia solani*. Such was the case with loss of oil and geraniol content in case of *Alsariella* due to the attack of *Curvularia andropogonias* (Janardhanan et al., 1980). Plant metabolites like chlorophyll and sugar were reduced considerably in *Eucalyptus globulus* by *Estalotopsis funera*, but protein percentage was increased considerably in infected leaves (Upadhye et al., 1979).

Although the status of many metabolic products due to fungal infections on essential oil plants have been worked out by several workers, scant attention has been paid towards correlation of metabolic factors with that of oil yield and quality. Therefore, it was considered pertinent to analyse some of the physiological behaviour of lemongrass crop under normal and diseased conditions together with the studies on certain host metabolites during the course of its different stages of growth under normal as well as diseased conditions to find out their effect on yield of essential oil and its quality.