SUMMARY

The influence of dynamic and diurnal changes under certain crop geometry and micronutrients on growth and floral characters, yield of biomass and essential oil of *Cymbopogon flexuosus* var. sikkimesis were studied under agroclimatic condition of Jorhat. For this, experiments were conducted during 1988-89 and 1989-90 at the experimental farm of RRL, Jorhat (India). The levels of crop geometry investigated were (4'93, 2'93, 1'23/m²). The doses tried for zinc (0, 15, 30, 45) and for boron (0, 10, 20, 30) kg ha⁻¹. The treatments comprising all the combinations (48) were compared in split plot design. The salient findings on the experiment are summerised below.

**Influence on Dynamic Changes**

Studies on dynamics of essential oil showed that their content was maximum in youngest leaves (7th & innermost leaves) which gradually decreased towards first leaves. Different plant density did not influence in recovery of essential oil in the leaves. Application of micronutrients i.e. zinc and boron did not affect in oil content at different maturity stages of leaves. However, a slight increase in oil content was observed with zinc at 30 kg ha⁻¹ and boron at 20 kg ha⁻¹, irrespective of the maturity of leaves in comparision to control. Methyl eugenol content showed reverse trend in comparision to oil content. Here, methyl eugenol content increased gradually with the maturity of leaves. Crop geometry and micronutrients did not effect methyl eugenol content of essential oil in any of the maturity stages of leaves.
Diurnal Changes in Oil and Methyl Eugenol

Diurnal changes in essential oil was highest during 1500 h when the temperature was recorded 26'4°C in first year and 32°C in second year under plant density of 4.93/m², zinc at 30 kg ha⁻¹ and boron at 20 kg ha⁻¹ in both the year of experimentation. The trend was similar in case of methyl eugenol content of oil.

Response to Crop Geometry and Micronutrients

Growth characters studied under crop geometry cum micronutrients revealed that plant height was not influenced by increase or decrease of plant population. Application of 30 kg ha⁻¹ of zinc and 20 kg ha⁻¹ of boron significantly increased the plant height in both the years. Maximum number of tiller per clump was found in 1'33/m² plant density with 30 kg zinc per hectare and boron 20 kg per hectare.

Different treatments of plant density did not effect single leaf area, leaf area per tiller and leaf area per clump. However, application of zinc and boron increased the single leaf area, leaf area per tiller and leaf area per clump. Application of zinc 045 kg ha⁻¹ and 30 kg ha⁻¹ significantly increased the single leaf area and leaf area per clump respectively. But in case of leaf area per tiller, significant variation was observed between 45 kg and 30 kg zinc per hectare in first and second year respectively. In case of boron, 20 kg ha⁻¹ application increased single leaf area whereas increase in leaf area per tiller and leaf area per clump was found at 30 kg ha⁻¹ application.
Length and weight of spike was enhanced by the application of 30 kg ha\(^{-1}\) zinc and 20 kg ha\(^{-1}\) boron with \(1'23/m^2\) plant density. Flower initiation occurred at the same time irrespective of different plant densities. Application of zinc (30 kg ha\(^{-1}\)) and boron (20 kg ha\(^{-1}\)) accelerated early initiation of flowering in both the year of experimentation.

Highest fresh biomass yield of the crop was recorded under \(4'93/m^2\) plant density with the application of 30 kg ha\(^{-1}\) zinc (25'356 t ha\(^{-1}\)) and 20 kg ha\(^{-1}\) boron (24'667 t ha\(^{-1}\)). However, yield per clump was maximum in \(1'23/m^2\) plant density. Similar trend was recorded in case of total yield of essential oil (93'768 kg ha\(^{-1}\) at \(4'93/m^2\) plant density, 103'137 kg ha\(^{-1}\) at 30 kg ha\(^{-1}\) zinc and 101'424 kg ha\(^{-1}\) at 20 kg ha\(^{-1}\) boron).

Plant density and application of zinc did not influence oil content of the crop, but boron @20 kg ha\(^{-1}\) only enhanced essential oil content.

The major component of the oil i.e. methyl eugenol was recorded to be maximum at highest level of zinc and boron without showing any effect at various plant density.

Uptake of Micronutrients

Uptake pattern of micronutrients viz. zinc, boron, copper, manganese and molybdenum were found to be least influenced by various plant densities. Optimum uptake of zinc was obtained at 30 kg ha\(^{-1}\) zinc while addition of boron caused adverse effect. However, boron
uptake was optimum at 15 kg ha\(^{-1}\) zinc and 30 kg ha\(^{-1}\) boron, though it was maximum at 30 kg ha\(^{-1}\) for both the nutrients. Copper, manganese and molybdenum uptake were not affected by zinc and boron application. Boron enhanced its own uptake, rather than for rest of the micronutrients. While zinc significantly helped zinc and boron uptake only, among all the nutrients, in both the years.