Effect of Co-60 Gamma Irradiated Sodium Alginate on Growth, Yield and Quality of *Mentha arvensis* L. and *Cymbopogon flexuosus* (Staud.) Wats.

Abstract of the thesis submitted to the Aligarh Muslim University, Aligarh, U.P., India for the award of the degree of Doctor of Philosophy in Botany, 2010.

Total four experiments were carried out on *Mentha arvensis* L. and *Cymbopogon flexuosus* (Staud.) Wats. Two pot (during 2007-2008) and two field (during 2008-2009) experiments were conducted on these crops. The salient points are summarized below.

**Experiment 1** (2007-2008): This pot experiment was conducted according to a simple randomized design, to study the effect of six concentrations of irradiated sodium alginate (ISA), viz. 20, 40, 60, 80, 100 and 120 ppm (designated as ISA-20 ppm, ISA-40 ppm, ISA-60 ppm, ISA-80 ppm, ISA-100 ppm, and ISA-120 ppm, respectively) on *Mentha arvensis* L. The aim of this experiment was to find out the optimum dose of ISA so as to get the best response of *Mentha arvensis* L. in terms of growth attributes (Shoot and root length per plant, Fresh and dry weights of shoot per plant, fresh and dry weights of root per plant), biochemical attributes (total chlorophyll content and total carotenoids content, nitrate reductase activity, and leaf-NPK contents) and quality (essential oil content and menthol content) and yield (essential oil and menthol yield) attributes. All the above parameters were analysed at 120, 135 and 150 days after planting (DAP). The effect of irradiated sodium alginate, at a definite concentration range of 60-100 ppm, was found significant for all the attributes at all three stages. 20 ppm concentration of un-irradiated sodium alginate was used as Control-2 which was found equaled with Control -1 (water sprayed) for most of the parameters studied at all three stages. The concentration 100 ppm proved optimum for most of the attributes studied.

**Experiment 2** (2007-08): This pot experiment was conducted on lemongrass *Cymbopogon flexuosus* (Staud.) Wats. according to a simple randomized design, to
study the effect of six levels of ISA viz. 20, 30, 40, 50, 60, 70 and 80 ppm (designated as ISA-20 ppm, ISA-30 ppm, ISA-40 ppm, ISA-50 ppm, ISA-60 ppm, ISA-70 ppm and ISA-80 ppm, respectively) on the basis of growth (Shoot and root length, Fresh and dry weights of shoot per plant, fresh and dry weights of root per plant), biochemical (total chlorophyll content and total carotenoids content, nitrate reductase activity, and leaf-NPK contents), quality (essential oil content and citral content) and yield (essential oil and citral yield) of the above mentioned plant. Growth, biochemical and quality parameters were determined at 120, 135 and 150 DAP. The effect of ISA application on all the parameters was found significant at all the stages. ISA-60 ppm proved to be optimum for most of the parameters studied.

**Experiment 3** (2008-09): This field experiment was performed on *Mentha arvensis* L. according to a simple randomized design, to authenticate the results of pot experiment regarding the effect of ISA levels viz. 20, 40, 60, 80, 100, 120 ppm (designated as ISA-20 ppm, ISA-40 ppm, ISA-60 ppm, ISA-80 ppm, ISA-100 ppm, and ISA-120 ppm, respectively) based on same parameters including the sampling stages as in Experiment 1. The data revealed that significant differences existed among the various levels of ISA application. The effect of irradiated sodium alginate, at a definite concentration range of 60-100 ppm, was found significant for all the attributes at all three stages. A 20 ppm concentration of un-irradiated sodium alginate was used as control-2 which was found equalled with control -1 (water sprayed) for most of the parameter studied at all three stages. The result of this experiment concordance with that of pot experiment (Experiment 1).

**Experiment 4** (2008-09): This field experiment was performed on lemongrass (*Cymbopogon flexuosus* Steud. Wats.) according to a simple randomized design, to authenticate the results of pot experiment regarding the effect of ISA levels viz. 20, 30, 40, 50, 60, 70 ppm and 80 ppm (designated as ISA-20 ppm, ISA-30 ppm, ISA-40 ppm, ISA-50 ppm, ISA-60 ppm, ISA-70 ppm and ISA-80 ppm, respectively) based on same parameters including the sampling stages as in Experiment 2. The data
revealed that significant differences existed among the various levels of ISA application. The effect of irradiated sodium alginate, at a definite concentration range of 30-60 ppm, was found significant for all the attributes at all three stages. 20 ppm concentration of un-irradiated sodium alginate was used as Control-2 which was found equaled with Control -1 (water sprayed) for most of the parameters studied at all three stages.