Abstract of the thesis, submitted to the Aligarh Muslim University, Aligarh, India, for the degree of Doctor of Philosophy in Botany, 1996.

Five field experiments on mustard (Brassica juncea L. Czern & Coss.) were undertaken during 'rabi' season at the 'University Agricultural Farm' of Aligarh Muslim University, Aligarh (27°52'N latitude, 78°51'E longitude and 187.45 m altitude above sea level) (India) from 1992 to 1995. The aim of the experiments were to select the best phytohormone and their concentration (Experiment 1) best stage of crop growth for spray (Experiment 2) and to find out the interaction effect of phytohormone with basally applied N, P and K fertilizers (Experiment 3, 4 and 5). The performance of the crop was assessed in terms of shoot length, leaf area, leaf area index, dry weight, N, P and K content of plant and their uptake at 40, 60, 80, 100 and 120 days after sowing (DAS). Crop growth rate, relative growth rate and net assimilation rate were calculated for 40-60, 60-80, 80-100 and 100-120 days interval. Pods/plant, seeds/pod, 1000 seed weight, seed yield, biological yield, harvest index, oil yield, oil content, acid value, iodine value and saponification value fatty acid composition (Experiment 3, 4 and 5) were studied at harvest.

Experiment 1 (1992-93) was conducted according to factorial randomised block design to select the best phytohormone and its concentration for improving the
performance of mustard. Phytohormones IAA, GA\(_3\) and kinetin at 0, 10\(^{-6}\), 10\(^{-5}\) and 10\(^{-4}\)M concentrations were sprayed on plants at 40 DAS. Spray of GA\(_3\) was found to be the best in comparison to other phytohormones used for most of the parameters studied. In growth parameters, GA\(_3\) was best at 80, 100 and 120 DAS for shoot length, at 100 and 120 DAS for leaf area and leaf area index. But both GA\(_3\) and IAA were equally effective for dry matter production. At final stage of growth spray of kinetin improved CGR, RGR and NAR of the crop. In biochemical parameters no difference was found between the different phytohormones in respective of the concentrations and uptake of N, P and K except that at 80 DAS when GA\(_3\) treatment had significantly more N uptake than kinetin treatment. In yield parameters there was more number of pods and seed yield due to GA\(_3\) spray in comparison to the other two hormone treatments. Concentrations 10\(^{-5}\)M and 10\(^{-4}\)M were mostly equal in their effect, but 10\(^{-5}\)M was selected as best because of its lower concentration. The interaction effect of phytohormone and concentration was found to be non significant for almost all the data.

Experiment 2 (1993-94) was conducted according to factorial randomised block design. The aim of this experiment was to select the best stage of growth for spray of the 10\(^{-5}\)M of GA\(_3\). The phytohormone (GA\(_3\)) and concentration 10\(^{-5}\)M was selected on the basis of findings of Experiment 1. The spray of water and 10\(^{-5}\)M of GA\(_3\) was done at 40, 60 and 80 DAS. It was found that the effect of spray at 40 and 60 DAS were at par for all the parameters at final stages but the values for seed yield was maximum in the treatment where the GA\(_3\) was sprayed at 40 DAS. Moreover, the spray at 40 DAS, even though at par with spray at 60 DAS recorded highest value. Hence 40 DAS was selected as best growth stage for spray treatment. The N, P and K concentration in plants remained unaltered by the
treatments. The interaction effect was significant for most of the parameters and it was found that there was difference in spray treatment only when GA$_3$ was sprayed and not when water was sprayed.

Experiments 3, 4 and 5 (1994-95) were simultaneously conducted according to factorial randomised block design to find out the effect of spray of 10$^{-5}$M GA$_3$ at 40 DAS along with basally applied 0, 40, 80 and 120 kg N/ha (Experiment 3), 0, 15, 30 and 45 kg P/ha (Experiment 4) and 0, 20, 40 and 60 kg K/ha (Experiment 5). The stage of spray of GA$_3$ was selected from Experiment 2. The parameters studied in these experiments were same as in earlier experiments and in addition, fatty acid composition of oil was also determined.

In general, GA$_3$ spray improved the performance of the crop in comparison to water spray control as noted in earlier experiments.

In Experiment 3, it was found that application of 80 kg N/ha proved optimum for almost all parameters studied viz; shoot length, leaf area, leaf area index and dry matter production at all stages of sampling. The CGR was significant only at 40-60 and 60-80 growth period. The RGR and NAR were significantly more in N$_{80}$ treatment at 40-60 and 60-80 growth stages in comparison to that of N$_0$ treatment but it was significantly inferior to N$_0$ treatment at 80-100 and 100-120 growth stages.

In biochemical parameters the N concentration was affected by different doses of N fertilizer and N$_{80}$ was found to be optimum. There was no significant difference between treatments in P and K concentration. N, P and K
uptake was also found to be optimum in $N_{80}$ treatment. In yield parameter, the 1000 seed weight and seeds/pod were non significant. Pods/plant and seed yield were optimum in $N_{80}$ treatment. Oil yield was also improved by $N_{80}$ treatment. The effect of 80 kg N/ha was at par with that for 120 kg N/ha. The interaction effect of phytohormone and nitrogen was significant for most of the parameters. There was no significant difference between water and GA$_3$ spray when the basally applied nitrogen was 0 or 40 kg N/ha. The effect of GA$_3$ spray was statistically significant only with the availability of sufficient nutrient for plant growth.

In Experiment 4, basally applied 30 kg P/ha was optimum for better performance of the crop. There was no significant difference in the N, P and K concentration in plant due to the different treatments. It was found that the interaction effect was non significant for all the parameters studied.

In Experiment 5, the data on various parameters was non significant.

It was found that GA$_3$ spray improved the fertilizer use efficiency and nutrient use efficiency of the crop. It was also found that GA$_3$ spray was profit oriented.