CHAPTER 6
SUMMARY
The present thesis comprises six chapters. In Chapter 1, the importance of the problem "Studies on the effect of soil and foliar application of nutrients on the performance of mustard" has been discussed briefly. In view of the lacunae in the understanding of the problem, justifications have been put forward for undertaking the present work. Moreover, the logical basis of each of the five field experiments undertaken has been briefly mentioned.

In Chapter 2, relevant available literature pertaining to mineral nutrition of rape-seed mustard has been reviewed.

Chapter 3 consists of the details of the materials and methods employed for the five field experiments and the relevant meteorological and edaphic data.

Chapter 4 includes the detailed data regarding crop response (growth and yield characteristics, leaf N, P and K contents and seed and oil quality). These were mostly found significant at P<0.05 on statistical analysis according to the design of each experiment. The salient data are summarised below:
Experiment 1 (1988-89) was conducted according to a factorial randomised block design, to study the effect of two sets of three combinations each of basal nitrogen and phosphorus with, top-dressed and foliar nitrogen applied to Rohini, Vaibhav and Varuna. Set (a) included: (i) $B_{N60P20}$ + $F_{W'}$, (ii) $B_{N40P20} + T_{N20'}$, (iii) $B_{N40P20} + F_{N20}$ and Set (b), (iv) $B_{N90P30} + F_{W'}$, (v) $B_{N60P30} + T_{N30}$ and (vi) $B_{N60P30} + T_{N30}$.

Treatment $B_{N60P30} + F_{N30}$ proved best for growth parameters and leaf N, P and K contents but was at par with $B_{N60P30} + T_{N30}$ for dry weight and leaf nitrogen and phosphorus contents. All yield characteristics were maximum in $B_{N60P30} + F_{N30}$, followed by $B_{N60P30} + T_{N30}$.

Variety Rohini showed maximum response for most parameters.

The interaction effect showed that $B_{N60P30} + F_{N30} \times$ Rohini was best for most of the parameters.

Experiment 2 (1989-90) was also conducted according to a factorial randomised block design. The aim of the experiment was to determine whether or not supplemental spray of 30 kg N/ha, that proved best in Experiment 1, was optimum for any or all the three varieties tested. Three doses of spray nitrogen (10, 20, and 30 kg N/ha) were applied to the basal dose $B_{N60P30}$ that proved superior in the
earlier experiment. Thus, the treatments were: (i) $B_{N90P30} + F_{N20}$, (ii) $B_{N60P30} + F_{N10}$, (iii) $B_{N60P30} + F_{N20}$ and (iv) $B_{N60P30} + F_{N30}$.

Treatment $B_{N60P30} + F_{N20}$ proved optimum for almost all characteristics, including seed and oil yield.

Variety Rohini performed best for almost all parameters, but was at par with Varuna in oil content. Vaibhav gave the poorest performance.

The interaction $B_{N60P30} + F_{N20} \times$ Rohini gave maximum value for most of the parameters.

Experiment 3 was conducted simultaneously with Experiment 2 according to a simple randomised block design. The aim of the study was to test if the efficacy of the combination that proved best in Experiment 1 ($B_{N60P30} + F_{N30}$) could be improved by adding small quantities of phosphorus and sulphur (alone or in combination) to the supplemental nitrogen spray, selecting variety Rohini, that out-yielded the others in Experiment 1, as the test crop.

Out of the six combinations namely (i) $B_{N90P30} + F_{N20}$ ($T_1$), (ii) $B_{N60P30} + F_{N30}$ ($T_2$), (iii) $B_{N60P28} + F_{N30P2}$ ($T_3$), (iv) $B_{N60P30} + F_{N30S2}$ ($T_4$), (v) $B_{N60P28} + F_{N30P2S2}$ and (vi) $B_{N60P28} + F_{N30P2S3.4}$ ($T_6$), the last was based on foliar application of 2 kg P/ha applied as monocalcium
superphosphate, which carried with it 3.4 kg S/ha, thus providing an inexpensive source of P and S that is easily available to the farmers.

Treatment $T_5$, closely followed by $T_6$, proved best for almost all parameters, but the latter proved superior on economic consideration.

Experiment 4 (1990-91) was carried out according to simple randomised block design on variety Rohini. The aim of this experiment, was to test if the efficacy of the optimum recorded combination in Experiment 2 ($B_{N60P30} + F_{N20}$) could be enhanced further by including small amounts of phosphorus and/or sulphur in the spray, as in Experiment 3. The treatments included: (i) $B_{N80P30} + F_W$ ($T_1$), (ii) $B_{N60P30} + F_{N20}$ ($T_2$), (iii) $B_{N60P28} + F_{N20P2}$ ($T_3$), (iv) $B_{N60P30} + F_{N20S2}$ ($T_4$), (v) $B_{N60P28} + F_{N20P2S2}$ ($T_5$) and (vi) $B_{N60P28} + F_{N20P2S3.4}$ ($T_6$).

Experiment 5 (1991-92) was conducted to confirm the findings of Experiment 4.

The pooled data of this two-year study revealed that Treatment $B_{N60P28} + F_{N20P2S2}$ and $B_{N60P28} + F_{N20P2S3.4}$. were at par and gave the maximum values for almost all growth parameters, leaf N, P and K contents and yield and quality characteristics, thus upholding the superiority of growing mustard variety Rohini with a starter basal dose of $N_{60P28}$.
and applying $N_{20}$ with $P_2$ and $S_{3.4}$ (as monocalcium superphosphate) to obtain highest economic returns.

In Chapter 5, the main results have been discussed in the light of the findings of earlier researches in our laboratory and elsewhere.

The present chapter is followed by an up-to-date bibliography of the references cited in the text and an appendix containing the various formulations employed for chemical analysis.