SUMMARY

The significance of the problem has been briefly considered. In view of the lacunae in our knowledge of the problem, justification has been put forward for undertaking the present research (Chapter 1).

The early history of mineral nutrition, and nomenclature, uses and fertiliser requirements of mustard have been reviewed (Chapter 2).

The details of the materials and methods employed for the six field experiments have been given. These have been supported by meteorological and edaphic data (Chapter 3).

The results obtained, which were mostly found to be statistically significant (Chapter 4), are summarised below:

In Experiment 1 (1976-77), laid according to factorial randomised block design, the effect of five combinations of basal nitrogen and phosphorus was studied on yield and yield attributing characters of two locally popular mustard varieties, Laha-101 and Peeli Sarson. A basal dose of 40 kg K₂O/hectare was kept constant in all the treatments.

Application of fertiliser nitrogen and phosphorus favourably affected all yield characteristics. The combination $N_{40}P_{40}$ proved optimum, followed by $N_{60}P_{40}$.

The variety Laha-101 performed better with respect to most of the yield characteristics and significantly out-yielded Peeli Sarson.
The values recorded for most of the treatment x variety interaction effects differed critically from each other with the no-fertiliser controls giving the lowest values for all the characters in both varieties. The interaction $N_{40}P_{40} \times \text{Laha-101}$ (equalled by $N_{60}P_{40} \times \text{Laha-101}$) proved best for number of pods per plant. For the number of seeds per pod, $N_{40}P_{20} \times \text{Peeli Sarson}$ and $N_{60}P_{20} \times \text{Peeli Sarson}$ proved best. The interaction $N_{60}P_{40} \times \text{Laha-101}$ registered highest values for the seed and oil yield.

In Experiment 2 (1976-77), laid according to split plot design, the effect of eight leaf-applied nitrogen, phosphorus and sulphur combinations (sub plot treatments) in the presence of two basal doses of nitrogen and phosphorus (main plot treatments) was studied on yield and yield attributes of Laha-101. A basal dose of 40 kg $K_2O$/hectare was kept constant in all the treatments.

The basal treatment $N_{60}P_{20}$ proved best for number of pods per plant, number of seeds per pod, seed yield and oil yield. However, in case of oil percentage and hecto-litre weight the treatment $N_{30}P_{10}$ gave highest values.

The spray treatment PS gave highest values for hecto-litre weight, oil percentage and oil yield. However, for number of seeds per pod, NP (equalled by NS, NPS and N) and for number of pods per plant and seed yield, NPS proved best.
Considering interaction effects, each spray treatment $x N_{60P_{20}}$ gave higher value than the corresponding spray treatment $x N_{30P_{10}}$.

At $N_{60P_{20}}$ level, spray of NPS gave highest value for pods per plant and seed yield, PS proved best for hecto-litre weight, oil percentage and oil yield whereas NP registered highest value for the number of seeds per pod. At $N_{30P_{10}}$ level, the spray of NPS proved best in case of seeds per pod, seed yield and oil yield, PS gave highest values for the hecto-litre weight and oil percentage whereas the number of pods per plant was highest with NS.

At both the basal fertiliser levels, hecto-litre weight and oil percentage were lowest in the spray of N.

Experiment 3 (1977-78), was laid according to factorial randomised block design. The object was to study the effect of five combinations of leaf-applied nitrogen, phosphorus and sulphur on yield and yield attributing characters of four selected varieties of mustard (B.R-40, Laha-101, T-11 and Varuna). A basal dose of 60 kg N, 40 kg $P_{2O_{5}}$ and 40 kg $K_{2O}$/hectare was kept constant in all treatments. The following inferences were drawn from this experiment:

Foliar application of PS gave highest values for pods per plant, seed yield, hecto-litre weight, oil percentage and oil yield. However, the number of seeds per pod was maximum with NS.
The variety Varuna proved best with respect to pods per plant, hecto-litre weight and oil percentage. The maximum values for seed yield and oil yield were given by T-11 whereas that for seeds per pod was maximum in Laha-101.

The interaction PS x Varuna gave highest values for pods per plant, hecto-litre weight, oil percentage and oil yield. However, for seed yield, the interactions NP x T-11 and NS x T-11 recorded highest values.

Experiment 4 (1977-78) was similar to Experiment 3 except for the basal dose consisting of lower levels of nitrogen and phosphorus (40 kg N, 20 kg P₂O₅ with 40 kg K₂O/hectare). The gist of the findings is as follows:

The treatment NB gave highest seed and oil yields, PS gave maximum hecto-litre weight and oil percentage whereas pods per plant were maximum with NP.

The variety Varuna again gave maximum values for all the characters considered. It was followed by Laha-101, B.R-40 and T-11, in that order.

The interaction NS x Varuna registered highest values for pods per plant, seed yield and oil yield. PS x Varuna recorded maximum values for hecto-litre weight and oil percentage.

In Experiment 5 (1978-79) on Laha-101, laid according to factorial randomised block design, the treatments consisted of the same five foliar combinations of nitrogen, phosphorus and
sulphur as in Experiments 3 and 4. Spraying was however, done either at 50 and 70, 50 and 90 or 70 and 90 days after sowing. A basal dose of 60 kg N, 20 kg P₂O₅ and 40 kg K₂O/hectare was given uniformly to all plots. The results may be summarised as follows:

The spray treatment PS proved best, giving highest values for hecto-litre weight, oil percentage and oil yield, followed by NPS which gave maximum values for pods per plant, seeds per pod and seed yield.

The sprays at 70 and 90 days after sowing were more effective as compared to other combinations, in case of hecto-litre weight, oil percentage and seed and oil yield. However, the number of pods per plant and of seeds per pod was highest in the 50 and 70 days spray.

The interaction PS x (70 & 90 days) gave maximum values for hecto-litre weight, oil percentage and oil yield. The highest number of pods per plant was found in PS x (50 & 70 days). However, the highest seed yield was noted in NPS x (50 & 70 days).

Experiment 6 (1978-79) was laid according to split plot design to study the response of ten improved varieties of mustard to two selected combinations of basal nitrogen and phosphorus in the presence of a constant dose of potash (40 kg K₂O/hectare). This field trial provided the following information:
The basal treatment $N_{60}P_{40}$ gave higher values for pods per plant, seeds per pod, seed yield and oil yield. In case of hecto-litre weight and oil percentage, the highest values were recorded with $N_{40}P_{20}$.

The variety R.L-18, followed by T-16 and Varuna, proved best with respect to pods per plant, seeds per pod and seed and oil yield, whereas Varuna gave highest values for hecto-litre weight and oil percentage.

At $N_{60}P_{40}$ level of basal fertiliser, variety R.L-18 recorded highest values for pods per plant, seeds per pod and seed and oil yield. Six of the ten varieties, including R.L-18, T-16 and Varuna, gave equally high values for hecto-litre weight and oil percentage. At $N_{40}P_{20}$ level also, R.L-18 proved best with respect to pods per plant, seeds per pod and seed and oil yield. However, the maximum values for hecto-litre weight and oil percentage were recorded in Varuna.

To sum up the findings of these six field experiments, the following generalisations may be made:

Foliar fertilisation of the crop was found to be very encouraging and, with small doses of nutrients, particularly phosphorus and sulphur, applied by spray, increments in yield attributes and yields of significant magnitude were obtained. When adequate nitrogen was given through soil, a combined spray of $\frac{2}{5} \text{ kg each of } P_{2O_{5}}$ and $S$ proved best for final yields. Nitrogen-
containing sprays enhanced seed yield by increasing pod and seed number but decreased oil percentage and consequently hectolitre weight.

It was further noted that the degree of response of foliar sprays was much higher in the crop grown with the lower fertiliser dose than when it was adequate. This indicates that, for the farmers of dry-land areas or for those unable to apply recommended doses of basal fertiliser due to economic or other constraints, foliar fertilisation would considerably enhance yields.

Lastly, it was found that foliar sprays at later growth stages were more effective. Sprays at 70 and 90 days may, therefore, be recommended for optimum yields. These could conveniently include an insecticide for aphid control which is generally a problem at these stages.

The significance of the data has been discussed in the light of the findings of other researchers on mustard. Suggestions for future lines of work have also been given (Chapter 5).