Summary
SUMMARY

Studies on the performance of some promising genotypes of linseed (*Linum usitatissimum* Linn.) in respect of growth, production potential and returns as affected by nitrogen levels & zinc levels under irrigated Vertisols were taken up during *rabi* seasons of 1988-89 and 1989-90 at the JNKVV, Zonal Agricultural Research Station, Powarkheda, Hoshangabau (M.P.).

The treatment combinations consisting of 4 levels of nitrogen (0, 40, 80 & 120 kg ha\(^{-1}\)) x 3 varieties (K-552, Kiran & Jawahar-23) were allocated to main-plots, while the sub-plot treatments comprised of 3 levels of zinc (0, 10 & 20 kg ha\(^{-1}\)). The experiment was laid-out in a split-plot design keeping three replications.

The salient findings of the investigation, based on two-year average, have been summarized below:

6.1 Effect of nitrogen

i. Application of nitrogen enhanced the morphological characters, *viz.*, plant-height and branches plant\(^{-1}\).
appreciably up to 80 kg ha\(^{-1}\) and 40 kg ha\(^{-1}\), respectively, during the period beyond 30 DAS.

ii. The increasing levels of nitrogen up to 120 kg ha\(^{-1}\), shortened the duration for onset of flowering to a limited extent of 1 to 4 days resulting in corresponding expansion of reproductive period without affecting the stage of physiological maturity of the crop.

iii. The crop response to nitrogen with regard to dry matter production, beyond 30 DAS, was appreciable up to 120 kg N ha\(^{-1}\) at 60 DAS, and 80 kg N ha\(^{-1}\) at 90 DAS & harvest. The crop growth rate (CGR) was increased appreciably, after 30\(^{th}\) day of sowing, with application of nitrogen up to 120 & 40 kg ha\(^{-1}\) at 60 & 90 DAS, respectively, but at harvest, it declined considerably with non-significant differences among the levels of the nutrient.

iv. Application of nitrogen, up to 80 kg ha\(^{-1}\), enhanced significantly the yield attributing parameter viz., capsules plant\(^{-1}\), seeds capsule\(^{-1}\) & seed yield plant\(^{-1}\); however, the 1000-seed weight remained unaffected due to supply of nitrogen.

v. The productivity of the crop in terms of straw & seed was positively enhanced by nitrogen application up to 80 kg ha\(^{-1}\). The harvest index was improved appreciably up to 40 kg N ha\(^{-1}\).
vi. The protein content in seed was improved remarkably with the increasing levels of nitrogen. The supply of nitrogen did not influence the oil-content in seed appreciably, but the maximum numerical value in that respect was noted with 40 kg N ha\(^{-1}\) which declined significantly under 120 kg N ha\(^{-1}\) when compared to the aforesaid dose.

vii. Concentration of nitrogen in straw was significantly enhanced with its application upto the highest level.

viii. Zinc concentration, in top half of the plant recorded at 40 DAS, and in seed was appreciably enhanced due to the application of nitrogen upto 40 kg ha\(^{-1}\); however, its supply was ineffective with respect to zinc concentration in straw.

ix. The accumulation of nitrogen in seed was enhanced significantly due to its application upto the highest level of 120 kg ha\(^{-1}\), Zinc accumulation in seed as well as straw was markedly increased with the supply of nitrogen upto 80 kg ha\(^{-1}\).

6.2 **Performance of genotypes**

The variety R-552 out performed Kiran and Jawahar-23 exhibiting the highest values in respect of branches,
capsules & seed yield per plant, 1000-seed weight, dry matter m-row$^{-1}$ and CGR during reproductive phase of the crop, straw & seed productivity, harvest index and zinc accumulation in seed; however, it registered the minimum oil content in seed, nitrogen concentration in straw and zinc concentration in seed.

The cultivar Jawahar-23 came out with the maximum plant-height, & oil concentration in seed when compared to Kiran & R-552, but it had the lowest 1000-seed weight and accumulation of nitrogen in seed.

The variety Kiran registered the maximum concentration as well as accumulation of nitrogen in both seed & straw, while the capsules plant$^{-1}$, biomass, seed yield, HI & zinc accumulation were recorded to be the minimum in its case.

6.3 **Effect of zinc**

The effect of zinc was positive on plant-height, branches plant$^{-1}$, biomass, CGR, capsule bearing and seed yield plant$^{-1}$, and productivity of straw & seed; however, in case of former two characters, this enhancement was
numerical only, while rest of the above parameters were affected appreciably due to zinc supply with a parity between 10 & 20 kg levels of that nutrient.

The accumulation of nitrogen in straw and seed was enhanced appreciably only at 20 kg Zn ha\(^{-1}\) but the concentration and accumulation of zinc, in both, straw and seed, were increased significantly with the increasing levels of zinc.

6.4 Economics of treatments

Application of nitrogen, at 80 kg ha\(^{-1}\), resulted in the maximum net monetary gain as well as net-benefit; cost ratio. Its supply at 89.45 kg ha\(^{-1}\) was worked out to be the optimum for linseed production.

The cultivar R-552 fertilized at 80 kg N & 10 kg Zn per hectare out performed Kiran and Jawahar-23 with regard to productivity, net returns and net-benefit; cost ratio.

The application of zinc at 10 kg ha\(^{-1}\) was most economical in terms of both net-profit as well as net-
benefit: cost ratio. Its dose at 15.25 kg ha\(^{-1}\) was computed to be the optimum.

6.5 Conclusions

The findings are concluded below:

1. Nitrogen upto 80 kg ha\(^{-1}\) enhanced the productivity in terms of seed and straw as well as yield attributing parameters, except 1000-seed weight of irrigated linseed crop. The oil content in seed was the maximum at 40 kg N ha\(^{-1}\).

2. With regard to the productivity of seed & straw, the response of that crop to zinc was positive upto 10 kg ha\(^{-1}\).

3. Among the three cultivars, viz., R-552, Kiran & Jawahar-23, the former one showed the best performance in respect of seed & straw yields.

4. For linseed, the optimum doses of nitrogen and zinc were worked out to be 89.45 kg and 15.25 kg per hectare, respectively.

5. Nitrogen at 80 kg ha\(^{-1}\) and zinc at 10 kg ha\(^{-1}\) registered the maximum net-benefit: cost ratio.
6.6 **Suggestion for further work**

On the basis of experience gained during the course of investigation the following suggestions are put forth for further work:

1. The literature on response of irrigated linseed to various macro & micro-nutrients is not only inadequate but many a times indicate conflicting results. The study with regard to response of the linseed crop to the combinations of macro (N, P, K & S) at their different levels with and without micro-nutrients showing significant influence e.g. Zn & boron, iron as essential for manipulating their effect on morphological characters & yield attributes through efficient physiological & bio-chemical activities in the plant.

2. There is a need for calibration of soil test values against the probability of yield response of the crop to fertilizer. This may be of special significance with regard to phosphorus and potash as these nutrients have not received the desired attention in relation to this crop so far.

3. More number of genotypes having insect & disease resistance as well as high yield potentials are required to be studied for their response to afore-said nutrients under irrigated conditions.