Introduction
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Linseed (*Linum usitatissimum* Linn.) is an important oilseed crop of winter season in India, providing a traditional source of industrial vegetable oil, especially used for manufacture of paints, varnishes, oil cloth, water-proof fabrics and linoleum. While, its oil is sporadically consumed in edible form, the cake is utilized as a good concentrate feed for animals as well as manure. The fibre extracted from the plants of linseed can serve as a useful material for fabric industry.

In the global picture, India ranks first in area (1.15 million ha), fourth in production (0.372 million metric tonnes) and eighth in productivity (267 kg ha\(^{-1}\)) with regard to linseed. Within the country, the state of Madhya Pradesh shares nearly 60 per cent of the linseed area (4.81 lac ha) with 1.79 lac tonnes of production and 274 kg ha\(^{-1}\) productivity. Presently, the linseed cultivation is mainly confined to rainfed areas. The yields are considerably low due to poor genotypes lacking in insect & disease resistance, sub-standard crop management practices and very low and unbalanced use of plant nutrients. In the recent past, a sizable irrigated area has also been
diverted to this crop necessitating the modifications in its cultivation practices to suit the changed microclimate.

The experiences indicate that the prevalent cultivars being grown under rainfed conditions do not respond adequately to improved crop production technology adopted under irrigated system of cropping due to inherent biological limitations as well as occasionally show increased susceptibility to insects & diseases therefore, it would be essential to test the farming situation specific suitability of available varieties having desirable yield, quality, and diseases and pest resistance characters.

Oil seeds, including linseed crop, are energy-rich crops, but they are grown mostly under starved conditions. Because of this, there has been a near stagnation in respect of the production and productivity of linseed as evident from the growth trends, witnessed during the last one and half decades. There exists a wide gap between the yields harvested under farmer's fields and those obtained due to the adoption of improved technologies.
A balanced supply of nutrients is one of the key factors responsible for realising the yield potential of the crop. Aulakh *et al.*, (1985) reported that a linseed crop yielding 1600 kg ha$^{-1}$ removed 96 kg N, 13 kg P, 72 kg K, 9 kg S, 50 kg Ca, 21 kg Mg, 73 g Zn, 1.062 kg Fe, 283 g Mn & 48 g Cu per hectare. Some of nutrients viz., nitrogen phosphorus, potash, Ca and Mg are required by the plants in substantial quantities. The content of phosphorus, potash, Ca and Mg in the soil is generally medium to high depending upon soil formation, but that of nitrogen fluctuates between very low to low. Obviously, the hunger signs of nitrogen are noticed earlier when the supply of this nutrient falls short of the requirement, particularly under irrigated conditions. Nitrogen is one of the primary or major plant nutrients. It is an integral part of the chlorophyll essential for photosynthesis and all proteins. Hence, the determination of optimum need of nitrogen by linseed became necessary.

With the intensive cropping & adoption of high yielding varieties and continuous unbalanced supply of nutrients, the soil has started exhibiting the symptoms of decline in fertility, especially with regard to micro-nutrients as observed in the form of restricted growth
and stagnated yields. The soils of Madhya Pradesh are reported generally deficient in respect of available zinc (Takkar et al., 1989). Uncorrected deficiencies of these micro elements can lower the efficiency of major nutrients for which the country is making huge investments. In this region of irrigated deep Vertisols, this has come true particularly in respect of zinc.

Zinc is vital for the processes of oxidation in the plant cells and for the transformation of carbohydrates. It regulates the consumption of sugar in the plant. Lack of zinc reduces the source of energy for the production of chlorophyll. Zinc is necessary in several enzyme systems that regulate various metabolic activities in plants. Zinc is also needed for the formation of auxins, the growth promoting substance in plants. Lack of zinc inhibits the uptake of water causing a stunting of growth. Zinc deficient plants may show enlarged cells, a reduction in the number of chloroplasts, an absence of starch grains and the accumulation of phenolic materials in the leaves. Zinc deficiency is often associated with calcareous and/or sandy soils; it may be aggravated by high levels of phosphorous. (Anonymous, 1986).
Being a trace element, it is required in small quantity. Although, it is an essential element but its excess application may be phytotoxic due to various reasons. Thus, the assessment of its precise need would be desirable.

In view of the aforesaid reasons, also the availability of scanty information on suitability of improved genotypes for irrigated deep Vertisols and their response to nitrogen and zinc with reference to yield attributing parameters, yield and quality, the present investigation was undertaken with the following objectives:

1. To find out the effect of nitrogen and zinc levels on the growth parameters and productivity of linseed varieties under irrigated Vertisols.
2. To determine the response pattern and most appropriate dose of nitrogen for linseed under irrigated Vertisols.
3. To find out the effect of nitrogen levels on the oil content of different linseed genotypes.
4. To work out the economy of nitrogen management under irrigated Vertisols.
5. To study the interaction between nitrogen and linseed varieties.

6. To study the behaviour of different genotypes of linseed under different zinc levels in irrigated conditions.

7. To study the interaction effect of nitrogen levels, zinc levels and some promising genotypes in respect of plant characters, quality of seed and productivity.