Pearl millet \textit{[Pennisetum glaucum (L.) R. Br.]} belongs to family Poaceae and genus \textit{Pennisetum}. It is a highly cross-pollinated crop with protogynous flowering and wind borne pollination mechanism, which fulfill one of the essential biological requirements for hybrid development. Pearl millet is diploid (2n=14) in nature and commonly known as bajra, cat tail millet, and bulrush millet in different parts of the world, which is believed to be originated Africa.

Pearl millet is an important coarse grain crop and serves as stable diet for the millions of people thriving under hunger. The crop is able to thrive under adverse conditions and also form an important fodder crop for livestock population in arid and semi arid regions of India. Pearl millet is the sixth most important and widely grown potential cereal crop in the world and is the fourth in India, after rice, wheat and maize.

Pearl millet is short day, warm weather plant with extraordinary qualities of drought and salt tolerance. It is a highly nutritious cereal with high levels of metabolizable energy, protein (9 to 15%), fat (5%) and mineral matters (2 to 7%). It is also rich in vitamins A and B, thiamin and riboflavin contents and imparts substantial energy to the body with easy digestibility (Pal \textit{et al.} 1996). The amino acid profile of pearl millet is more balanced than wheat and rice and many other cereals, and low glycemic index (Singh \textit{et al.} 1999 and Sehgal \textit{et al.} 2004). It is an important and low cost source of food for the poor in West Africa and India. Its contribution of micronutrients, especially iron [Fe] and zinc [Zn], is higher varying from 30% to 50% of the intake of these micronutrients from cereals (Rao \textit{et al.} 2006). It is grown on about 9.03 million hectare area with an annual production of 6.67 million tonnes and productivity 730 kg/ha. In Gujarat the cultivated area of pearl millet including kharif and summer season is an about 4.54 lakh hectare with production of 10.14 lakh metric tonnes with an average productivity of 2292 kg/ha. (Anon., 2017).

Micronutrient malnutrition has been designated as the most serious world’s population is at risk of deficiency in one or more essential mineral elements (White and Broadley, 2009 and Stein, 2010). The concern is more crucial for developing...
countries, especially in children, given that the statistics of malnutrition in these countries are high. More than half of the total populations in developing countries are reported to be affected by micronutrient deficiency and therefore are more susceptible to infections and impairment of physical and psycho-intellectual development (Anon., 2005). The mineral elements most commonly lacking in human diets are iron (Fe) and zinc (Zn) (White and Broadley, 2009 and Stein, 2010), whereas vitamin A and other essential minerals such as Calcium (Ca), Copper (Cu), Magnesium (Mg), and Iodine (I) can be deficient in some population’s diets as well (Genc et al. 2005). These deficiencies are caused by habitual diets that lack diversity (over dependence on a single staple food); situations of food insecurity, where populations do not have enough to eat (Anon., 2002); and low intake of vegetables, fruits and animal & fish products that are rich sources of minerals. The widespread deficiencies of Fe and Zn in developing countries are mostly due to monotonous consumption of cereal-based foods with low concentration and reduced bioavailability of Fe and Zn (Graham et al., 2001).

The diversification of cytoplasmic source not only insures the crop against any catastrophe associated with cytoplasm but also adds flexibility and nuclear diversity to breeding programmes. However, the availability of suitable restorer on these sources is a limiting factor in the development of hybrids. Through the A4 and A5 source were found to be highly stable, their utility is restricted due to non-availability of suitable restorers (Rai et al. 2006). Hence, the work in this direction is essential to make use of diverse sterile sources in the development of new pearl millet hybrids. For this purpose, it is necessary to explore the restorer genes in the germplasm pool and isolate the good combining restorer for commercial exploitation of heterosis on these diverse sources of cytoplasmic male sterile lines.

The most convenient and result oriented mating system to asses and evaluate a large number of parents and crosses is the line × tester analysis. Identification and assessment of the parental combinations with respect to their general and specific combining abilities and gene actions involved in the inheritance of grain yield and various component characters are of upmost importance for a successful hybridization programme.

The information on the magnitude and nature of prevalent genetic variation is essentially needed to infer about genetic potential of a particular population.
Combining ability studies are regarded useful to select best combining parents, which upon crossing would produce more desirable segregants. Such studies also elucidate the nature and magnitude of gene action involved in the inheritance of grain yield and its components, which will decide the breeding programme to be followed in segregating generations.

They are several techniques for evaluating the varieties or lines in terms of their combining ability and genetic makeup. Among these, line × tester analysis as proposed by Kempthorne (1957) has been extensively used to assess the combining ability of parent and crosses of different quantitative characters as well as to study the extent and magnitude of heterosis for yield and its contributing characters. Line × tester analysis is popular as it helps in testing a large number of genotypes to assess the heterosis, combining ability and gene action.

In heterosis breeding programme, it is essential to study and evaluate available useful promising diverse parental lines in there hybrid combination for yield, its component traits and quality parameter Fe and Zn. To identify a potential hybrid combination, study of the magnitude and direction of heterotic behavior is of paramount importance.

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Identification and assessment of the parental combinations with respect to their general and specific combining abilities and gene actions involved in inheritance of yield and its various component characters and micronutrient parameters Fe and Zn are of most importance for a successful hybridization programme, although, there has been an enormous achievement in pearl millet in respect of increasing the yield potential but a plateau has already been reached which requires precise and directed efforts to overcome it. The breeding work information with regard to Fe and Zn inheritance not available much more. The most convenient and result oriented mating system to access and evaluate a large number of parents and crosses in the line × tester analysis.
Keeping these aspects in view, the present study was undertaken with the following objectives.

- To assess the extent of heterosis for grain yield, its contributing traits and micronutrient traits (Fe and Zn).
- To estimate general combining ability of parents and specific combining ability of hybrids for different traits.
- To estimate the nature and magnitude of gene action involved in the inheritance of grain yield, its attributes and micronutrients (Fe and Zn).