Comments Peer J 101314-v0

The article "Assessing Population Structure and Morpho-Molecular Characterization of Sunflower (*Helianthus annuus* L.) for Elite Germplasm Identification" has been thoroughly examined. In my opinion, there is a lack of clarity in the study and research completed for this article. It needs to be improved since most of the phrases are written in an exceedingly casual and cursory style, and they lack depth. I have noticed few major issues in the article and are as follows-

Following points needs clarification and are as follows-

1. The intricacy of the article cannot be adequately conveyed by the abstract and introduction.
2. What is the elite material and why were the diversity studies conducted? Why were 48 types of germplasm chosen? Without knowing the breeding material/germplasm what's the use to know the diversity of the material? Since sunflowers are a cross-pollinated crop, will they naturally carry a variety of genes? Therefore, genes will be expressed in phenotypic expression, and diversity studies by genotyping with SSR markers will work in the same way. So studying the diversity among such kind of the material may not be useful.
3. Lines 93–94 In this investigation, three checks were used. Why were these checks used? Is it apparent to use the B line for the comparison out of the three checks, one of which is B line vis COSF 6B? How does the B line fit into the Check varieties?
4. Lines 94–96 During the 2022 kharif season, these accessions were evaluated and characterized using an augmented block design I with three replicates for check varieties for nine traits. Why is the block design augmented? Data from a single season and one location. Additionally, utilize standard terminology instead of the regional terms "kharif."
5. Line 127-128 and Line 174 publicly accessible SSRs reported by Tang et al. (2002), were employed for diversity study so neither the markers not the material used in this study is either speciality material and genic markers.
6. I truly don't get why studying population structure makes sense when diversity is being examined in the text. Many unnecessary discussions on gel images and PIC values which is really not required
7. Genetic diversity within and between populations using markers and genetic divergence based on morphological data would have been a good idea for the pre-bred lines assessed in various locations and seasons or for the specially designed breeding material.
8. While the elite sunflower germplams that was identified may be useful in the local context, it may not be of interest to breeders of sunflower breeders internationally.

In context to above comments, I am unable to endorse the article as it is now published in the Peer J journal.