Synthesis-Analysis for US Maize Planting Date on High-Yielding Environments

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INTRODUCTION

Maize planting date and yield relationship has been well documented. However a synthesis-analysis of a high-yielding data, mean yield is approximately 15 Mgha^{-1} from the US maize contest, that is believed to be able to provide an alternative to keep yield progressed, is not yet available.

OBJECTIVES

This study presents a synthesis analysis using the wining contest yield data and a three decade-published dataset aiming at providing a more insight into the relationship for US maize yield- planting date under different groups of latitude and yield environment.

MATERIAL AND METHODS

A high yield dataset collected from yield contest for 2011-2016 (Fig. 1 and 2) and a published dataset for last 3 decades were used in a analysis under different yield and latitude groups.

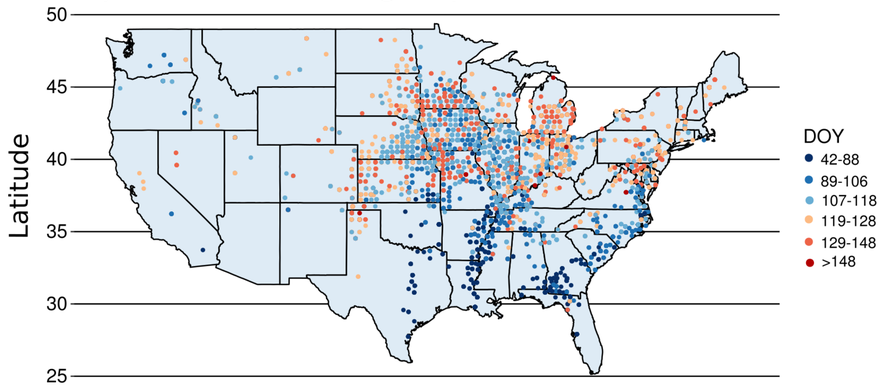

Fig 1. Map of US with point data shows location where maize yield data was collected and individual class of average planting date in different colors, the small cartography on the right shows different planting date groups expressed as day of year (DOY).

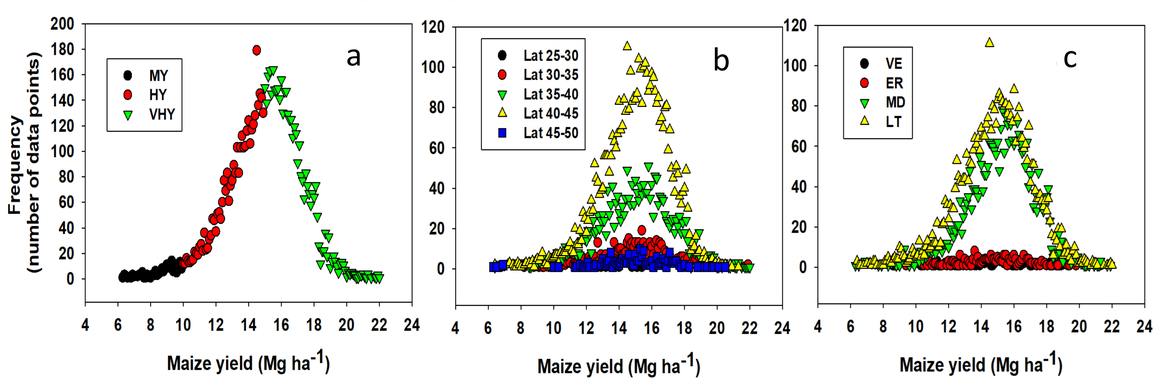

Fig 2. Maize yield distribution and classification by yield environment (a), by latitude (b), and by planting date within the latitude (c). Medium-yielding (MY), high-yielding (HY), and very high-yielding (VHY) environments yield 5-10, 10-15, >15 Mg ha^{-1}; very-early (VE), early (ER), medium date (MD).

Acknowledgment

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RESULTS

Main outcomes from this study were:

(i) A significant correlation between planting date and latitude (**Fig. 3**) and planting date categories at higher latitudes;

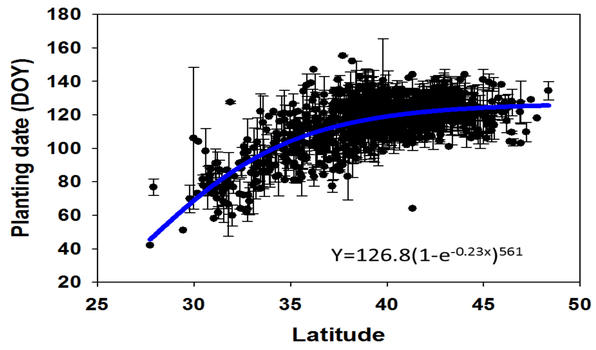

Fig 3. Planting date, expressed as days of the year (DOY), versus latitude for maize production within the US.

(ii) A significant difference between yield at different planting date categories at higher latitudes (>35°N) (**Fig. 4**).

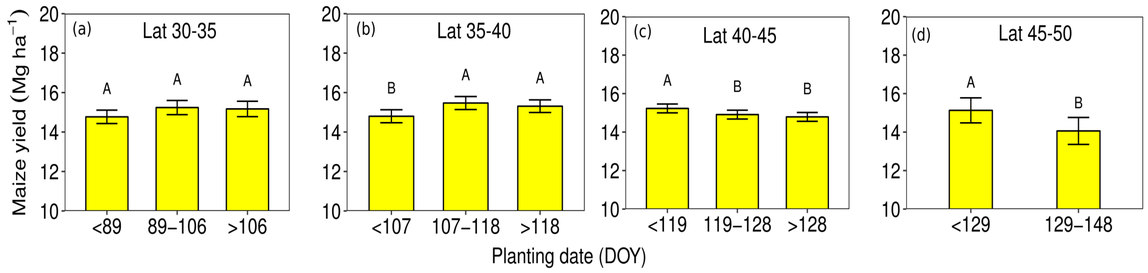

Fig 4. Maize yield and planting date by latitude, for the optimal planting range obtained for each latitude, and for the range before- and after- the optimal planting range. Panel a, 30-35°N, b, 35-40°N, b, 40-45°N, c, and 45-50°N, d .

(iv) Yield to planting date relationship fitted a bi-linear model for both yield contest and the literature data sets but with shorter duration and sharper yield reduction as the yield was reduced (**Fig. 5**).

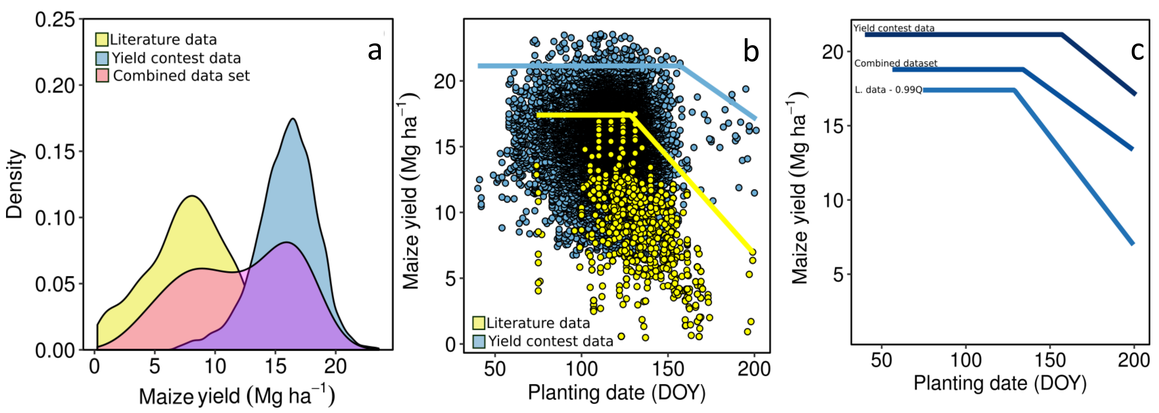

Fig 5. Frequency of yield data for the published database, maize contest and combined data set (a), Yield and planting date relationship of published data and maize contest data (b) and quantile regression models (c) .

CONCLUSIONS

(i) This synthesis-analysis suggests that planting date window is shorter in high- compared to low-latitudes;

(ii) Both the yield contest and literature data sets portrayed that for the yield and planting date relationship, the duration of the planting window increases with the yield potential.