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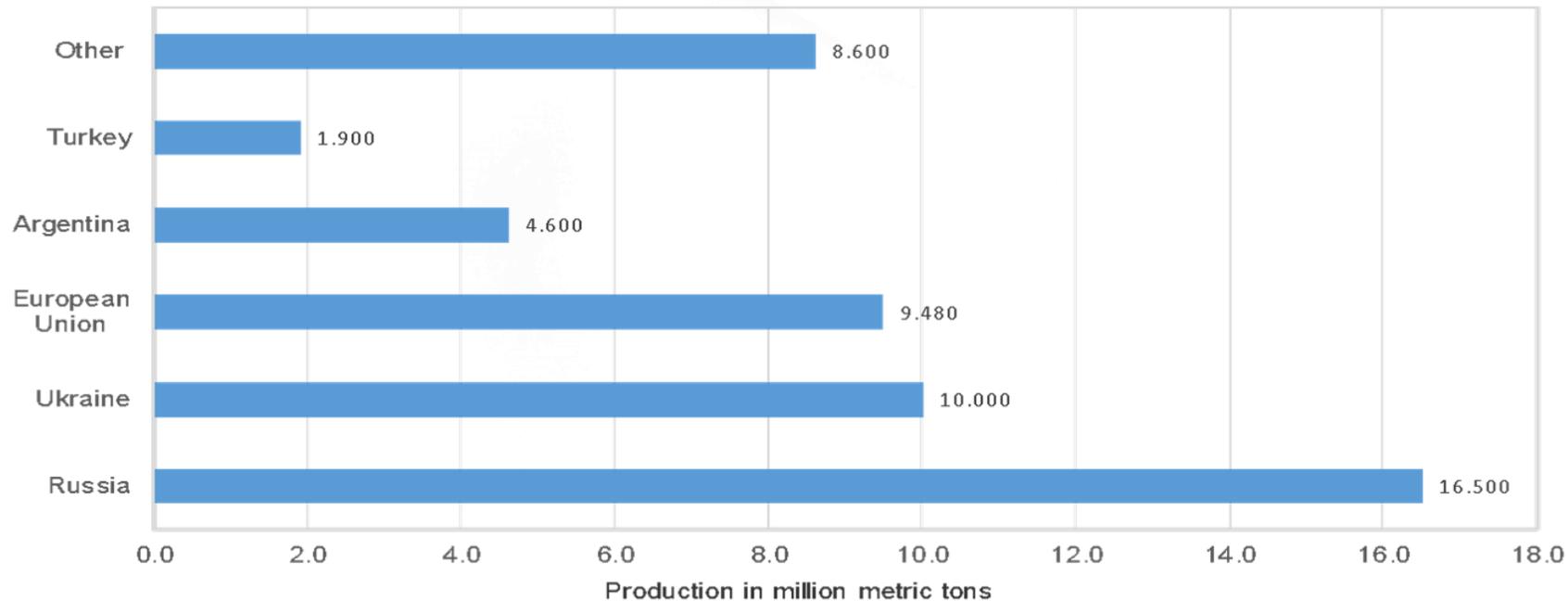
# The impact of planting dates and hybrid selection on sunflower grain yield and oil content

S. Maali<sup>1</sup>, N. Cochrane<sup>2</sup>, W. Makgoga<sup>1</sup> and J. Erasmus<sup>1</sup>

<sup>1</sup>ARC-Grain Crops Institute, POTCHEFSTROOM, <sup>2</sup> ARC - Biometry, Hatfield, South Africa

# World Sunflower Production

- Sunflower is an annual oilseed crop cultivated globally on approximately 27 million hectares that produced more than 51 million metric tons during the 2022/23 growing season
- This accounted for 8% of the world oilseed market (USDA 2023)



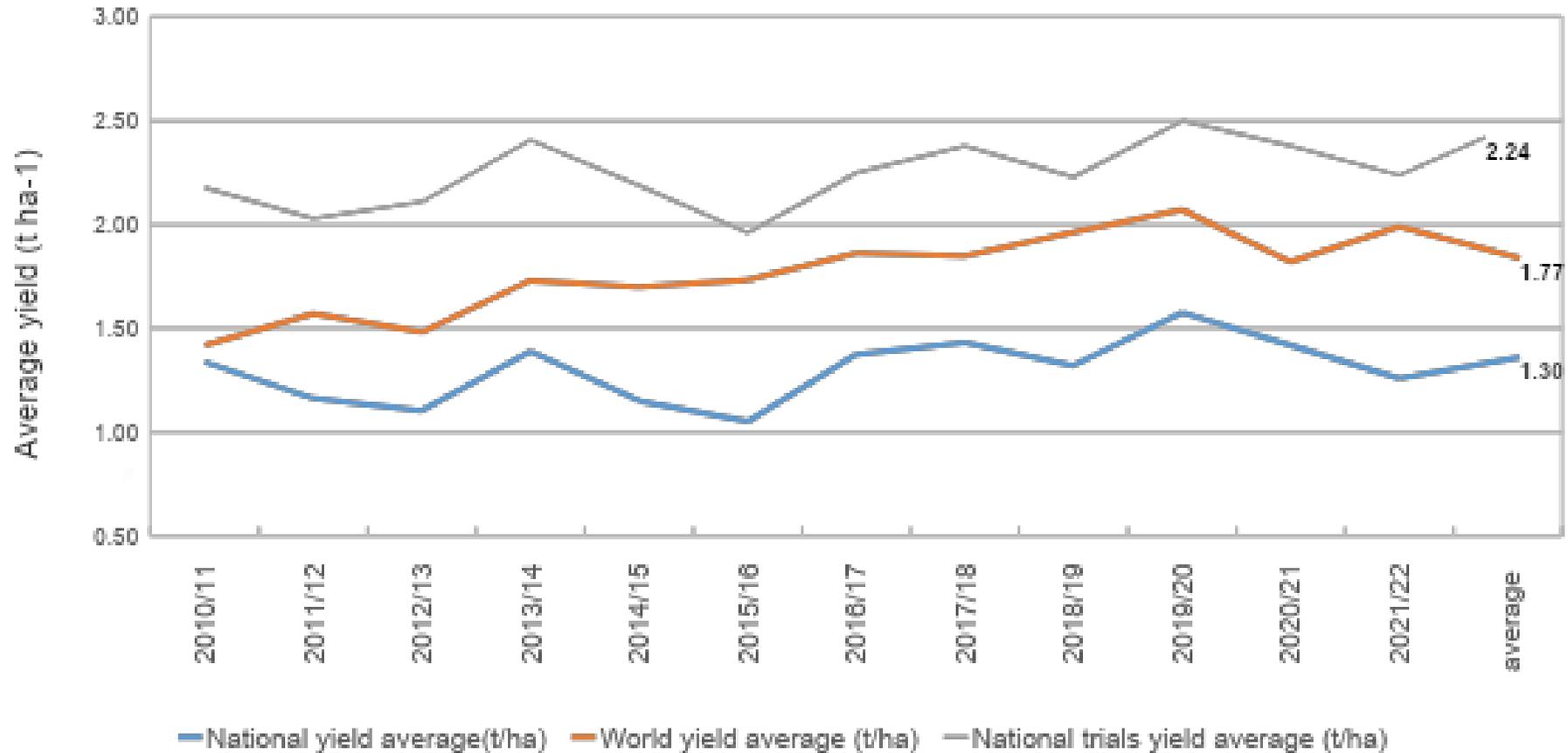
Production volume of sunflower seed in major producer countries in 2022/2023



## South African Sunflower Grain Production

- Sunflower seed is the fourth largest grain crop produced after maize, wheat and soybean
- Over the last 15 years, the average planted area was 565 563 hectares, producing an average of 740 832 tons
- The major sunflower-producing provinces are the Free State and North-West, which contributed 89% of the total crop
- The national yield average was calculated at 1.3 t ha<sup>-1</sup>

# National yield, trials yield average and world yield average from 2010 to 2022



## Reasons for the yield gap

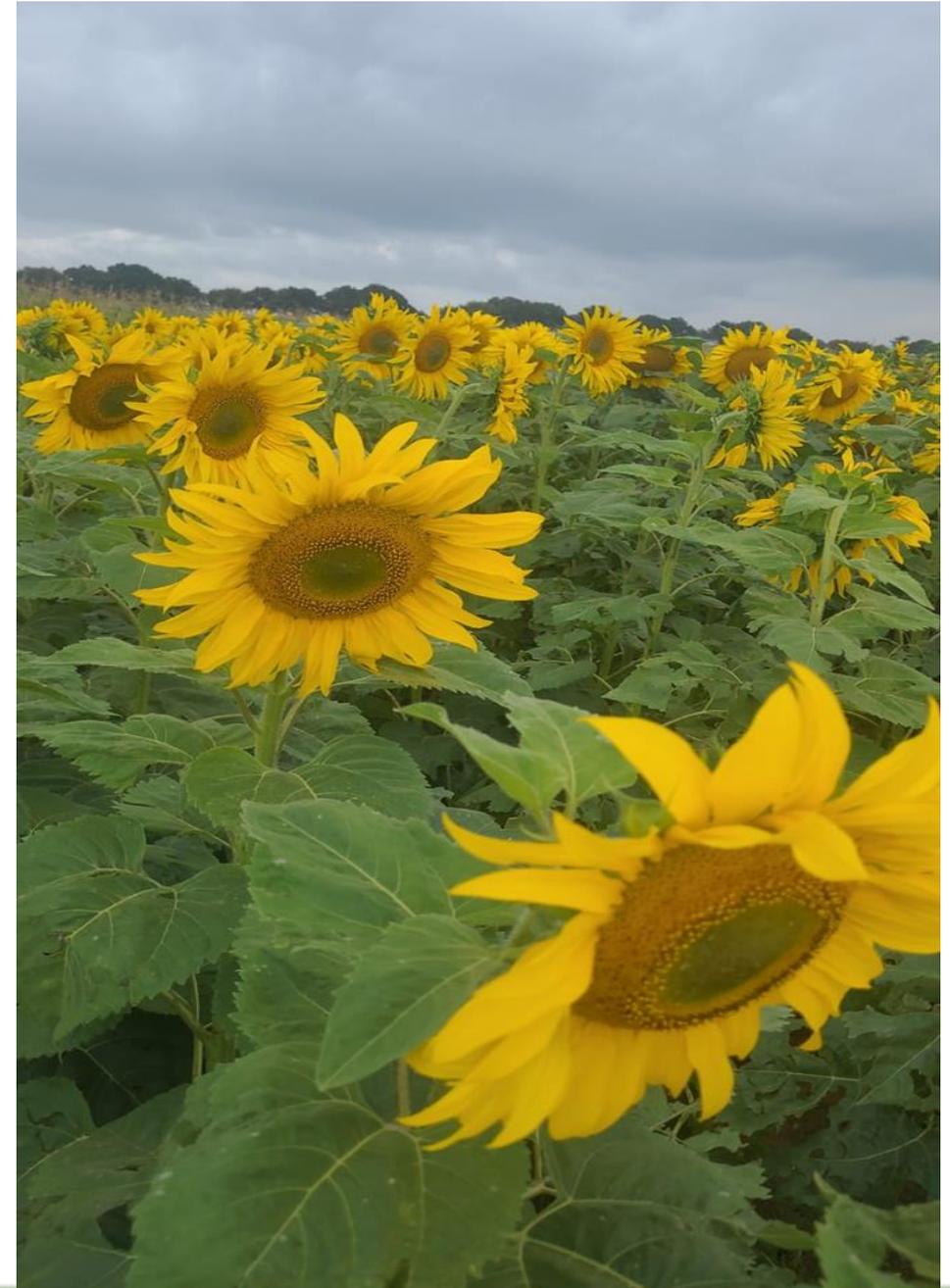
Farming practices such as

- **Planting dates**
- Planting density
- Field selection (soil pH)
- Fertilisation (Nitrogen)
- Introducing advanced sunflower hybrids

Environmental factors, including

- Air temperature,
- Day length,
- Intercepted solar radiation and
- Rainfall

Sunflower is most often not the first-choice crop  
CATCH Crop and not CASH Crop



# INTRODUCTION

The effects of planting date on grain yield and oil content of sunflower hybrids currently available in the South African market remain largely unknown.

The main objectives of this study were:

- To investigate the impact of planting dates on sunflower grain yield, oil content and oil yield
- To determine the optimal planting dates for different sunflower hybrids at the Potchefstroom research farm in the North-West Province, South Africa



## MATERIAL AND METHODS

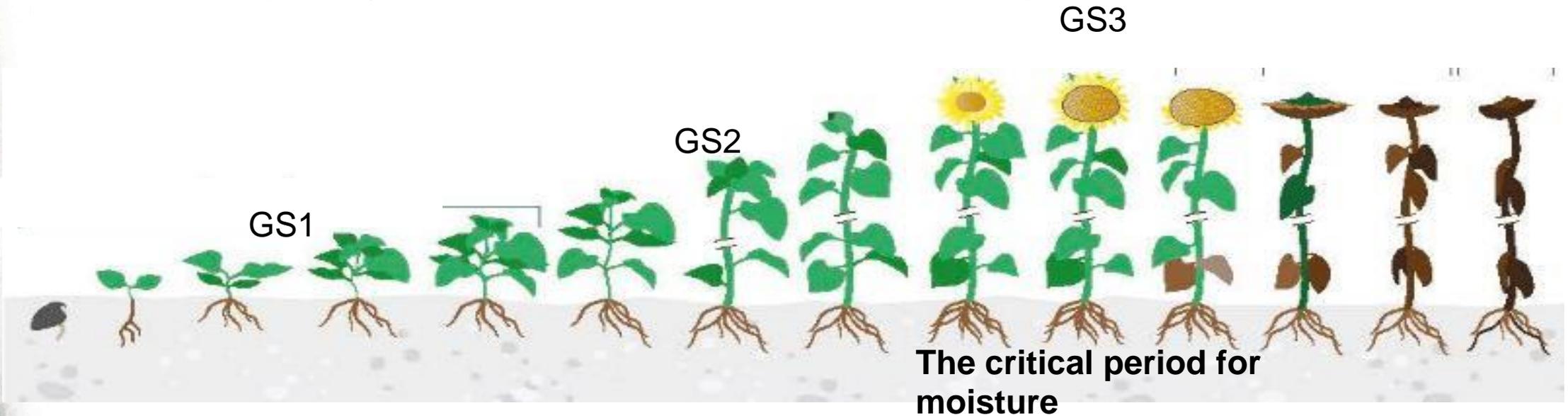
- Sixteen commercially available sunflower hybrids were selected and planted
- During the 2018/2019, 2019/2020 and 2020/2021 growing seasons
- Nine trials were planted from October to early February with different planting dates
- Trials were laid out in a randomised complete block design with three replicates
- Each plot consisted of four rows 10 m long with 0.90 m inter-row spacing total plot size (4 x 10 m x 0.90 m) for each experimental unit
- The middle 8 m in length of the two middle rows were harvested for yield and oil analysis



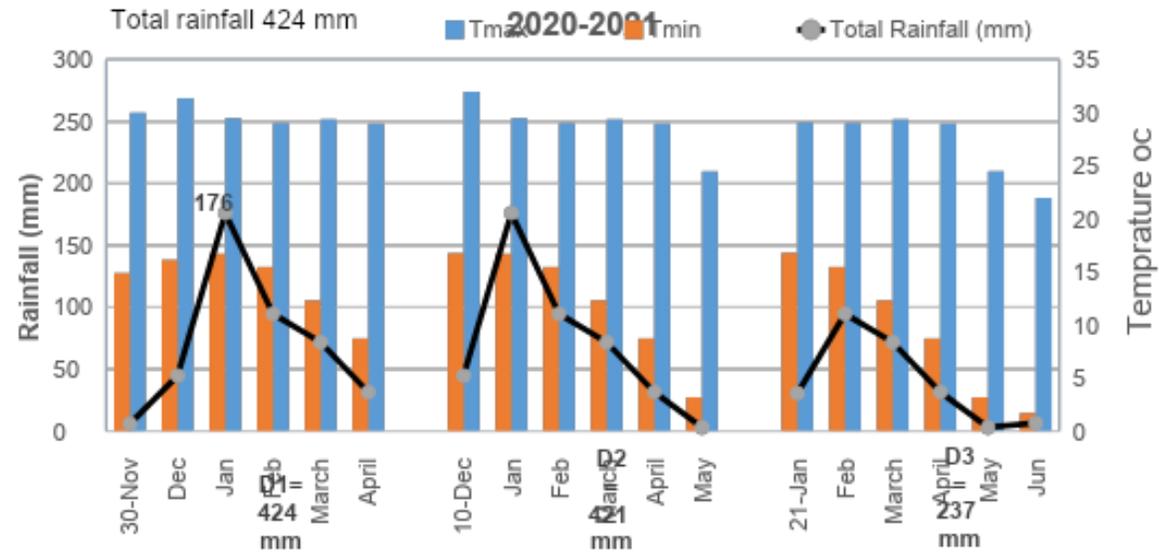
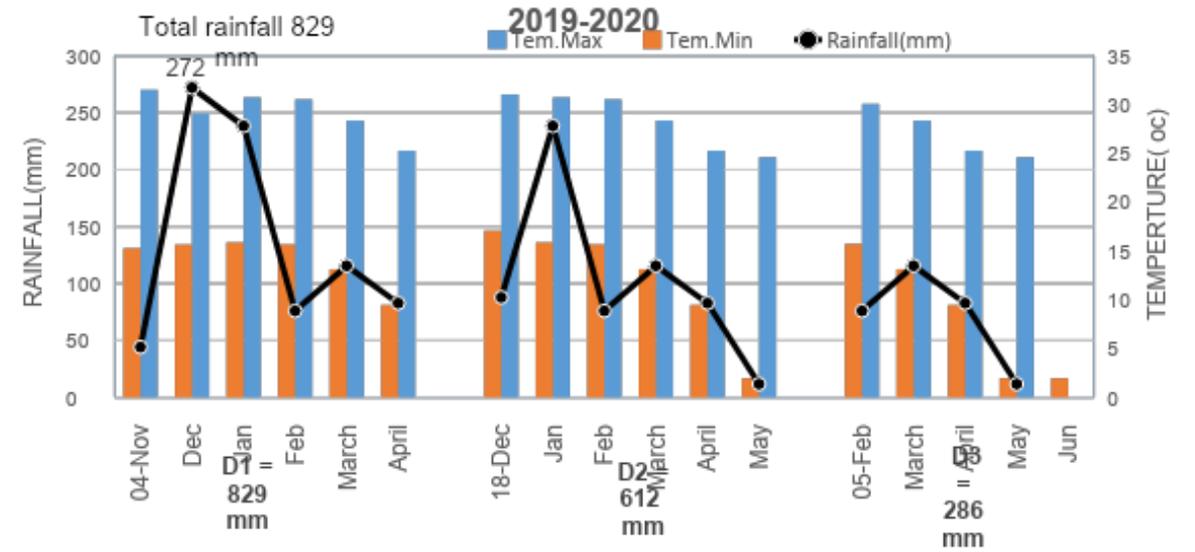
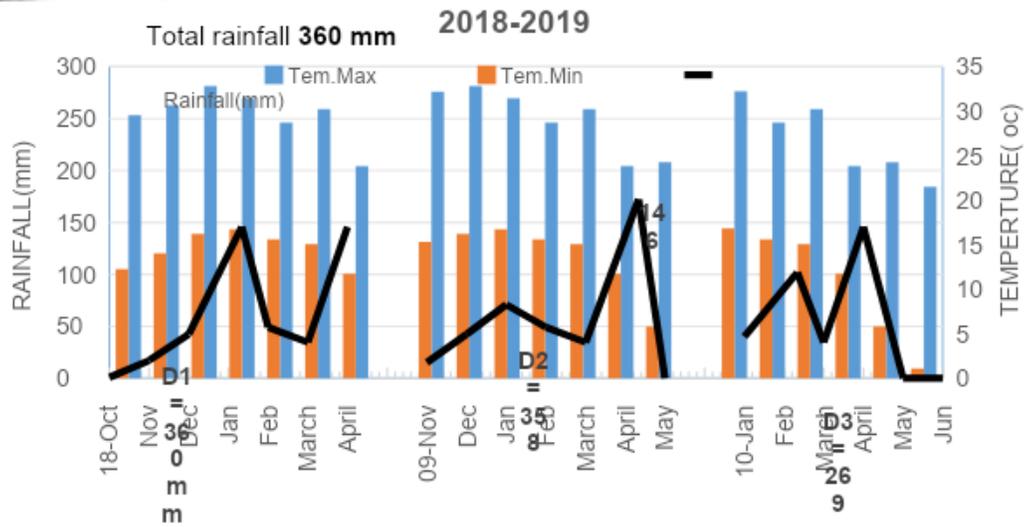
# Sunflower Planting Dates

## Plant growth stages

- Planting to floral initiation (GS1). Heads/ha
- Floral initiation to bloom (GS2). The head size, or the number of seeds/head
- Bloom to physiological maturity (GS3). Seed size and weight are determined



# RESULTS AND DISCUSSION



# Main effects of year, planting date and hybrid on measured responses

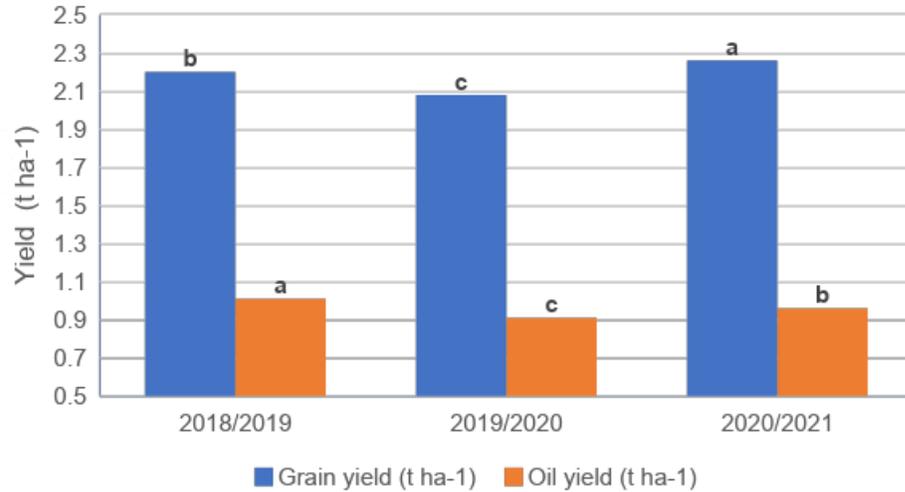
Combined analysis of variance for grain yield, oil content and oil yield of 16 sunflower hybrids planted in three different planting dates over three growing seasons

Source of Variation	DF	Grain yield (t ha <sup>-1</sup> )		Oil content (%)		Oil yield (t ha <sup>-1</sup> )	
		Sum Square (%)	Mean Square	Sum Square (%)	Mean Square	Sum Square (%)	Mean Square
Year (Y)	2	1.20	1.085 ***	13.999	738.378***	1.60	0.3678***
Planting date (D)	2	26.35	23.852 ***	17.954	947.032***	28.84	6.624***
Y x D	4	<b>50.02</b>	22.638***	9.95	262.516***	<b>42.85</b>	4.922***
Rep(Yx D)	18	3.60	0.362***	0.03	0.147*	2.95	0.075***
Hybrid (H)	15	4.51	0.544***	<b>49.09</b>	345.220***	10.09	0.309 ***
D x H	30	1.77	0.107***	2.39	8.412***	2.15	0.033***
Y x H	30	1.36	0.082*	2.27	7.982***	1.53	0.023***
Y x D x H	60	3.20	0.096***	4.12	7.245***	3.81	0.029***

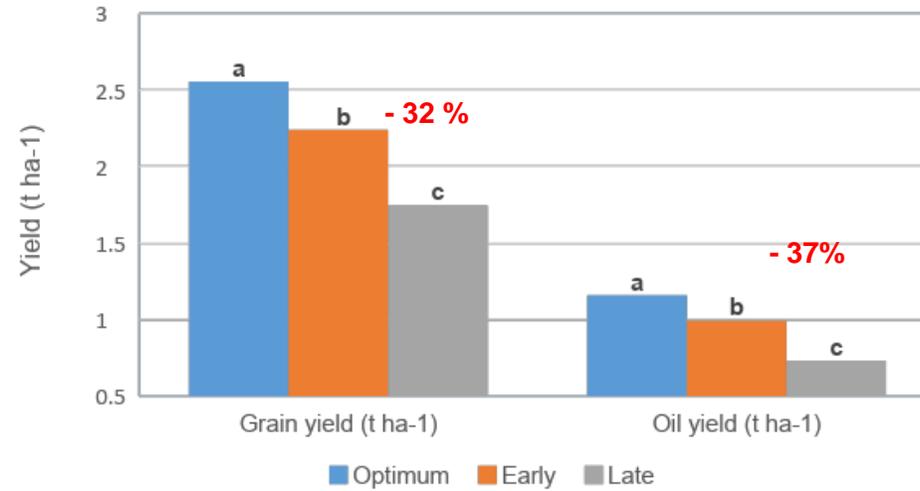
\*  $p < 0.05$ , \*\*\*  $p < 0.001$  DF = degree of freedom



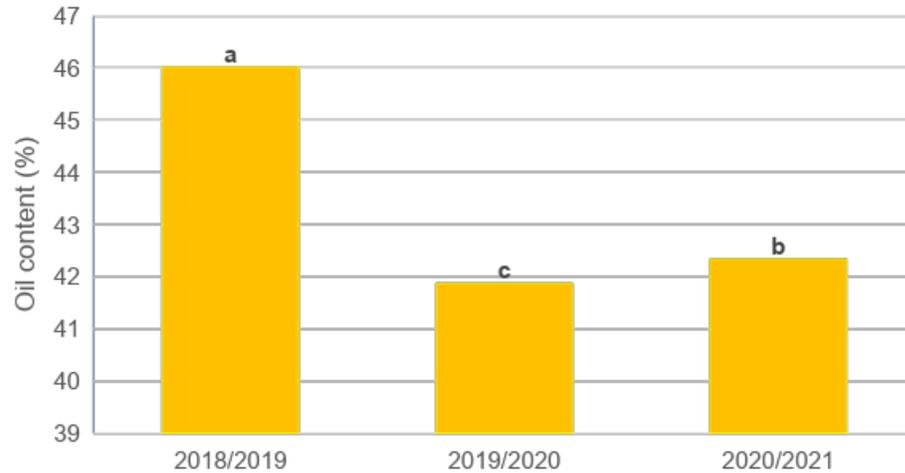
### Effect of year on grain and oil yield



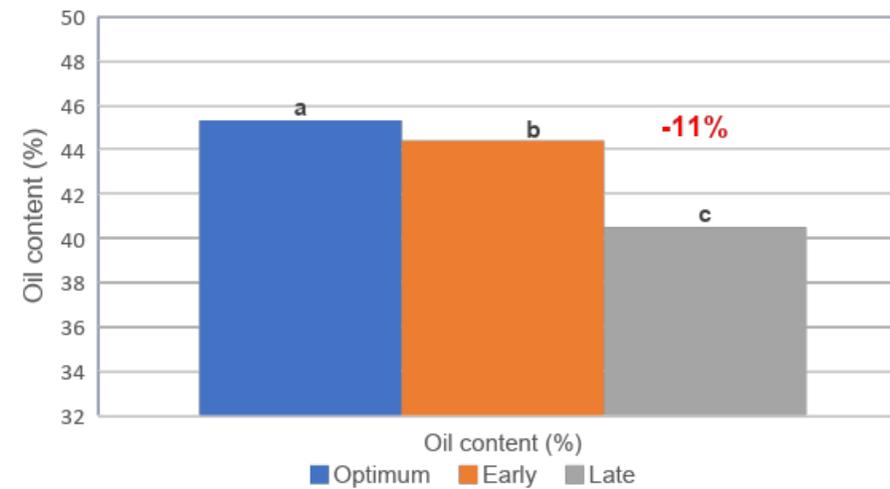
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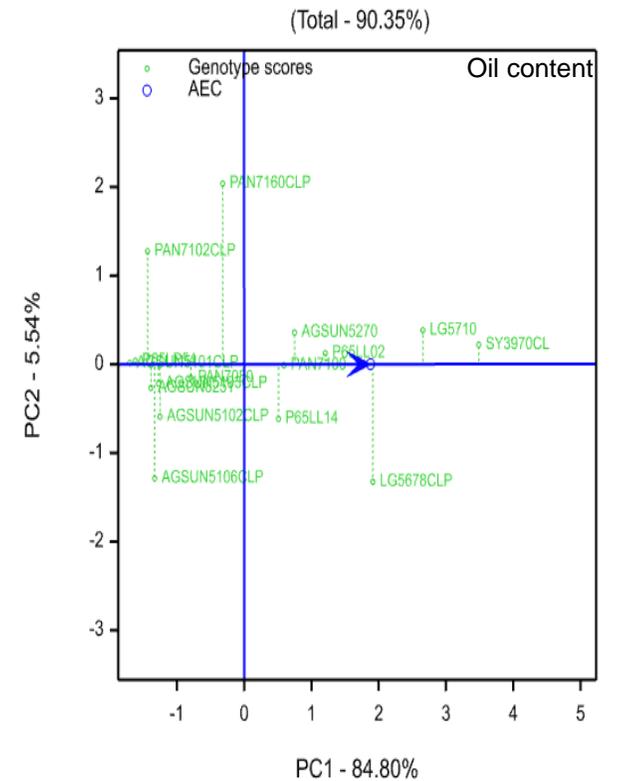
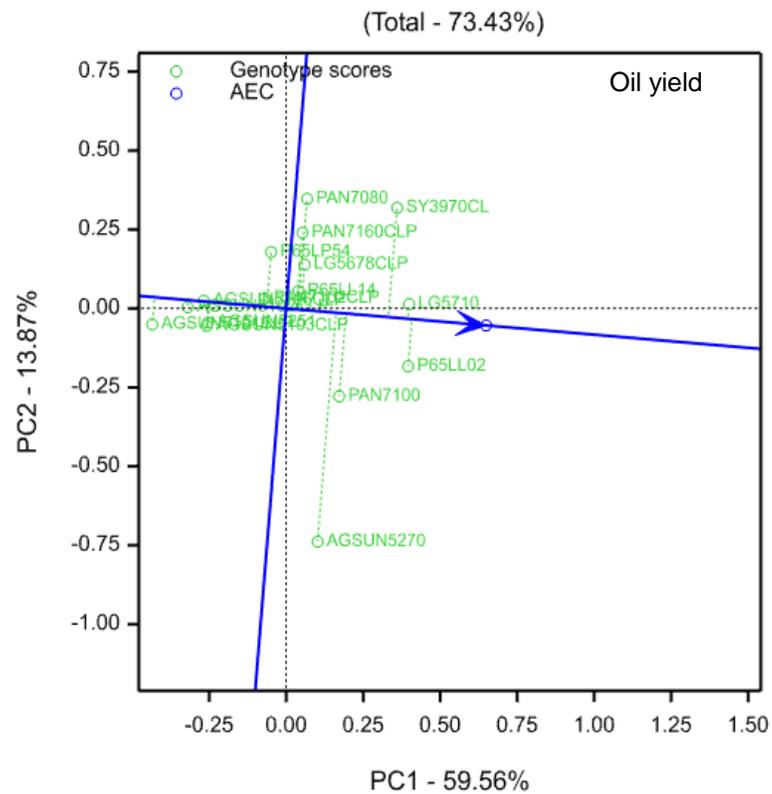
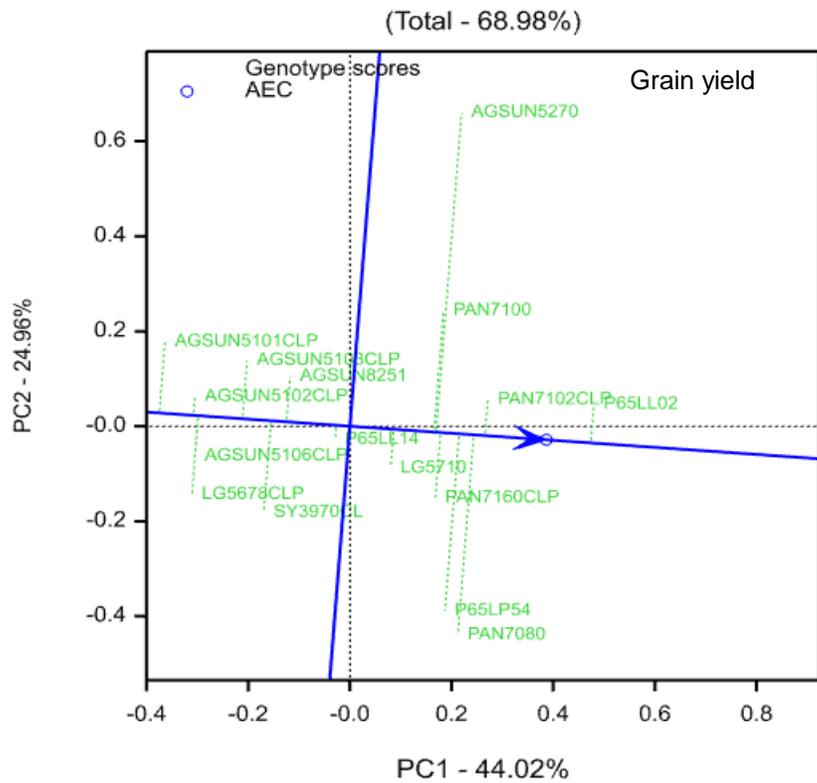
### Effect of year on oil content



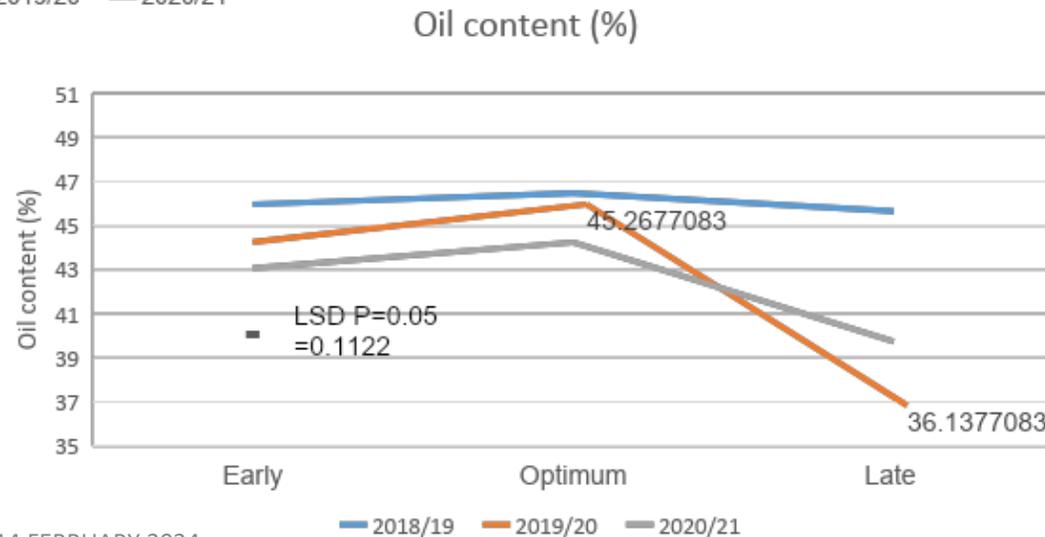
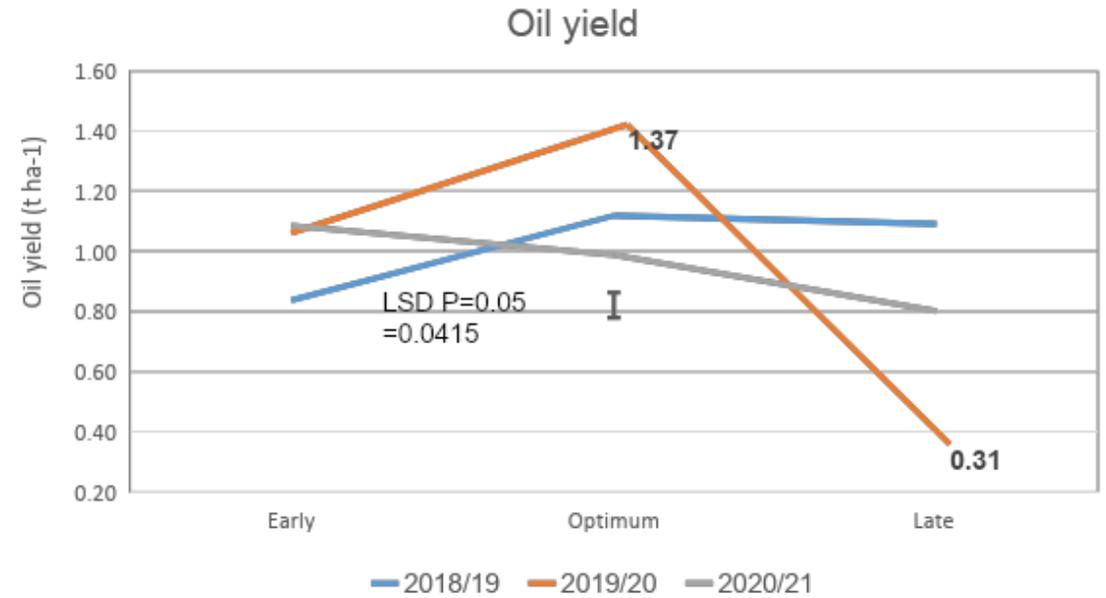
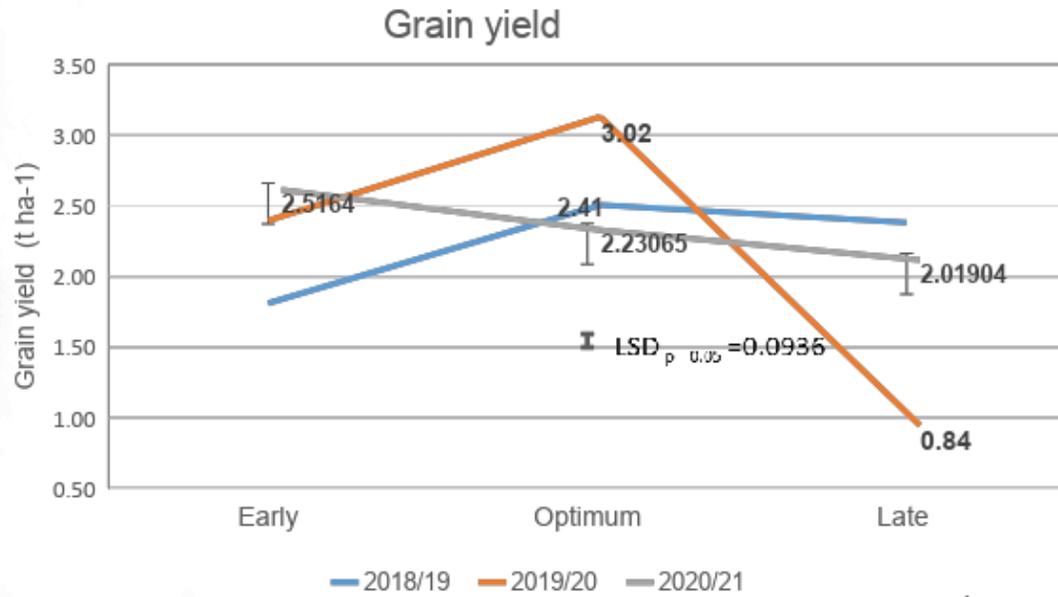
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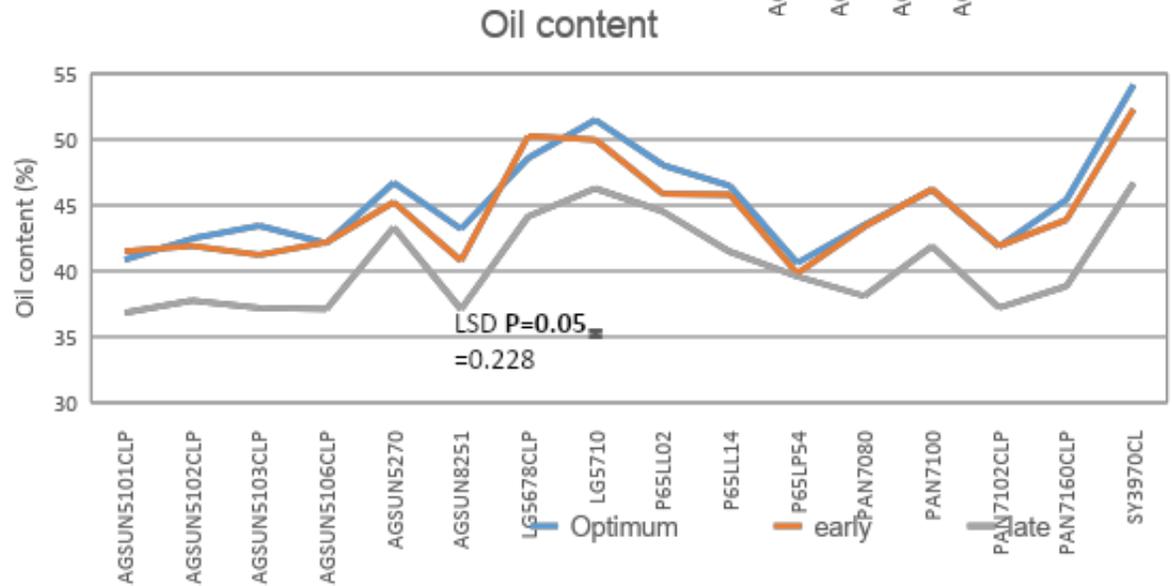
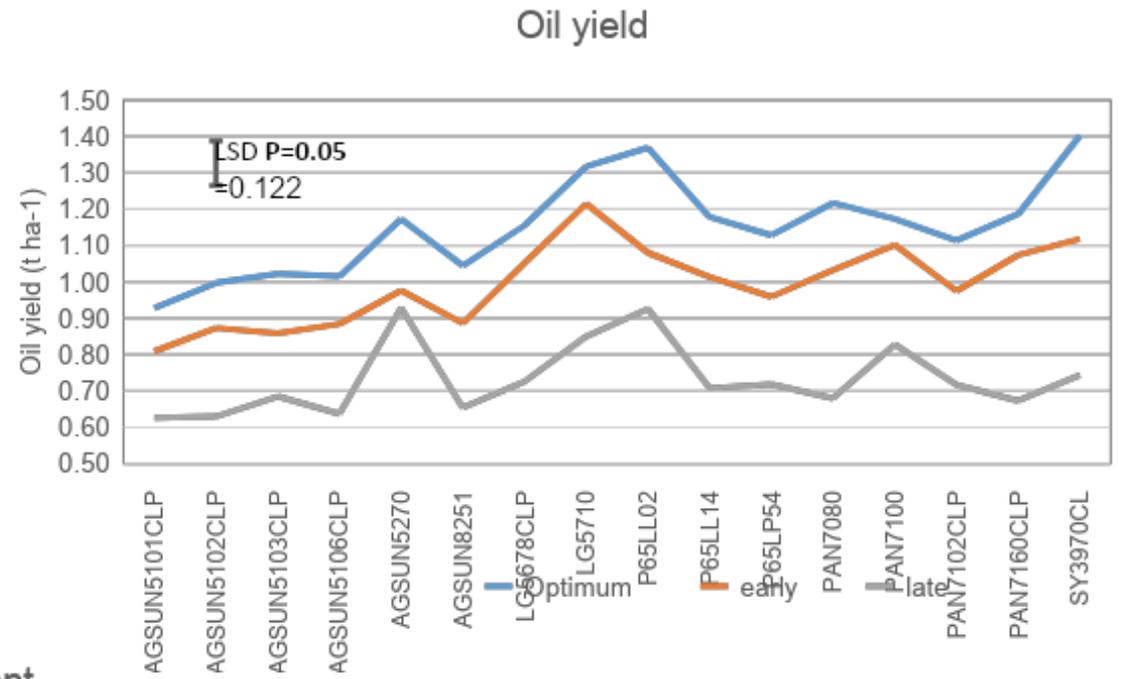
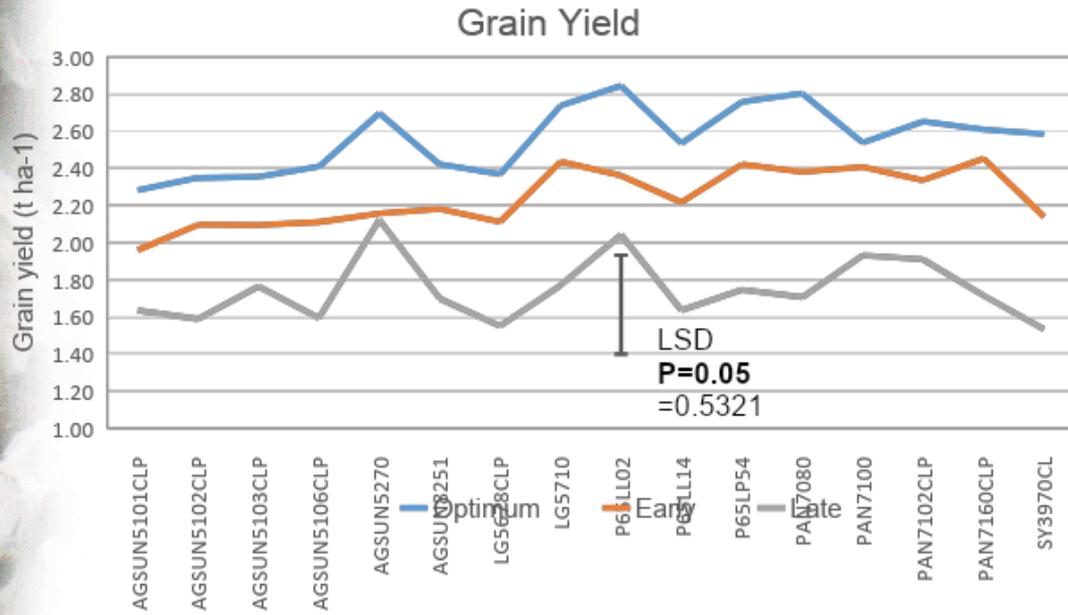
# Sunflower Hybrids Performance



# Year x planting date interactions

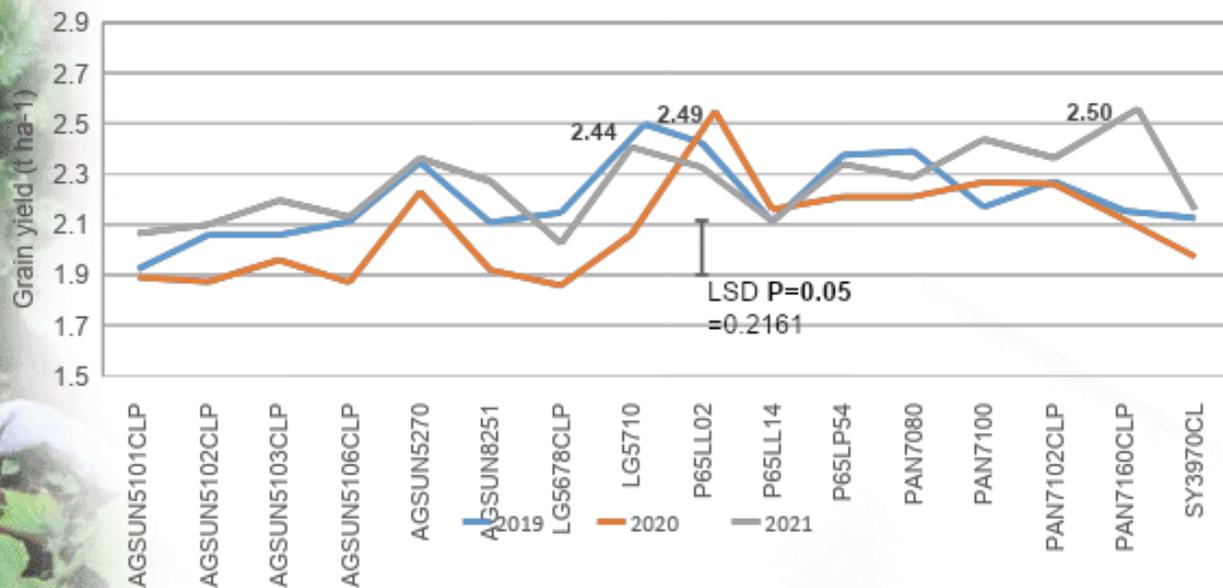


# Planting date X hybrid interactions

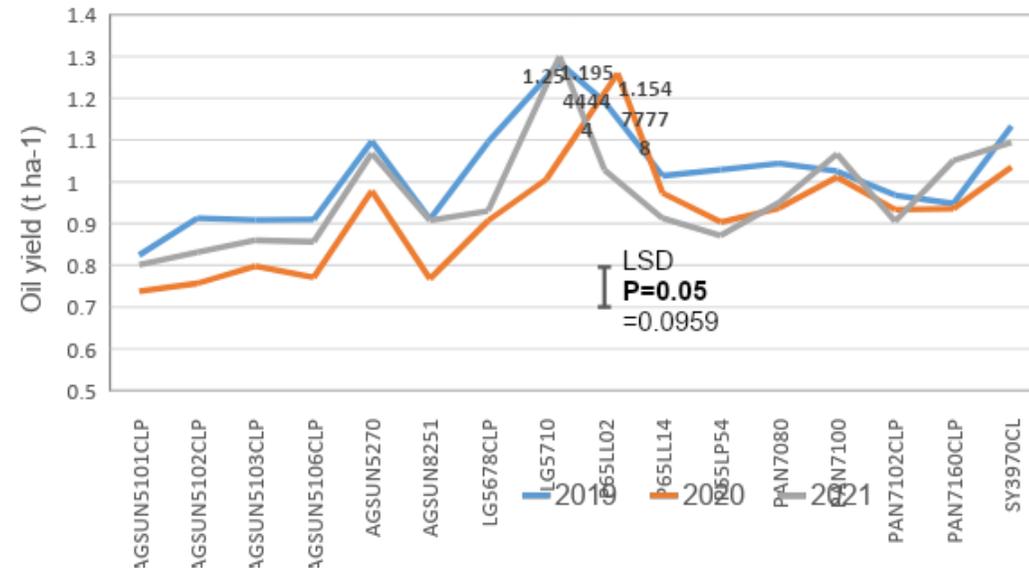


# Year X hybrid interactions

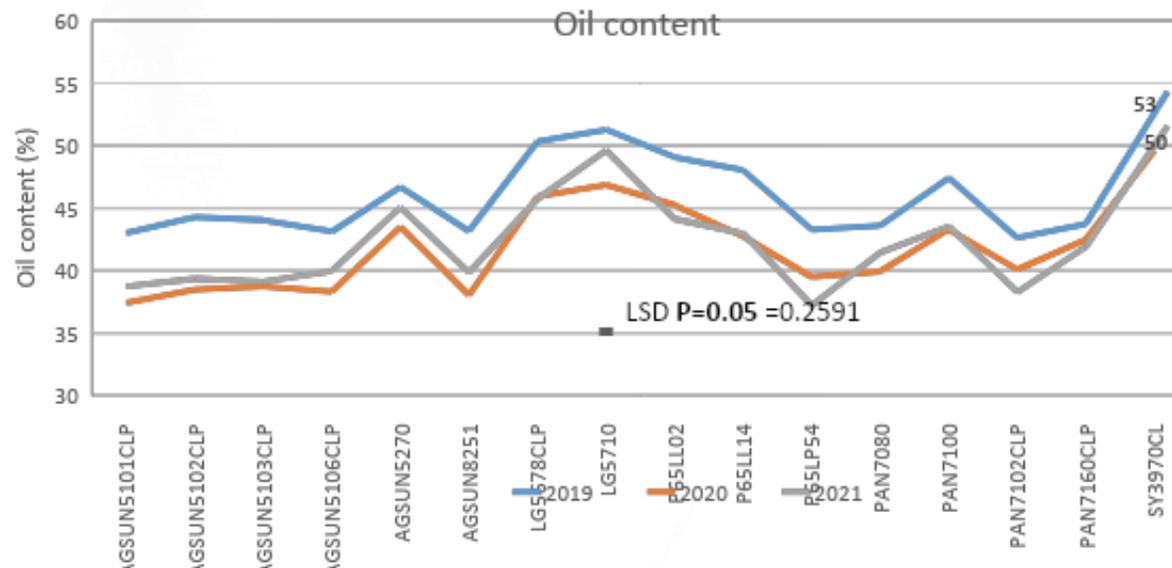
Grain yield



Oil yield



Oil content



# CONCLUSION

- The study highlights the substantial impact of planting date and hybrid choice on all studied parameters
- Planting sunflowers in November and December resulted in the highest grain yield, oil content, and oil yield, whereas planting in January and early February showed linear declines
- Depending on growing season conditions, January planting led to reductions of 1 to 20%, 2 to 10%, and 3 to 26% in grain yield, oil content, and oil yield, respectively. February planting significantly reduced grain yield by 72%, oil content by 20%, and oil yield by 77%
- Consequently, optimal sunflower planting dates are identified as being in November and December, with planting after the second week of January not recommended for optimal crop performance

## Acknowledgements

Execution of these trials was made possible through the financial support of the Agricultural Research Council and the Oil and Protein Seeds Development Trust. We would like to acknowledge the sunflower team of the ARC-Grain Crops for conducting the trials and technical support

