

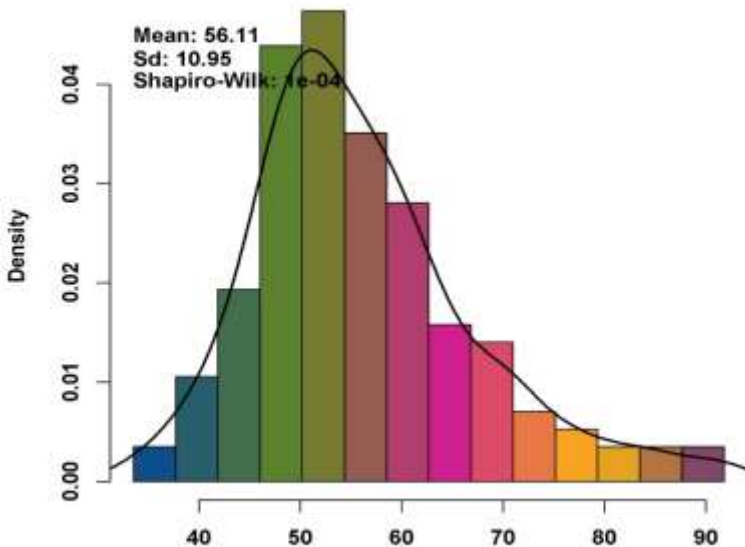


# Genome-Wide Association Studies localization Zn synthetic wheat

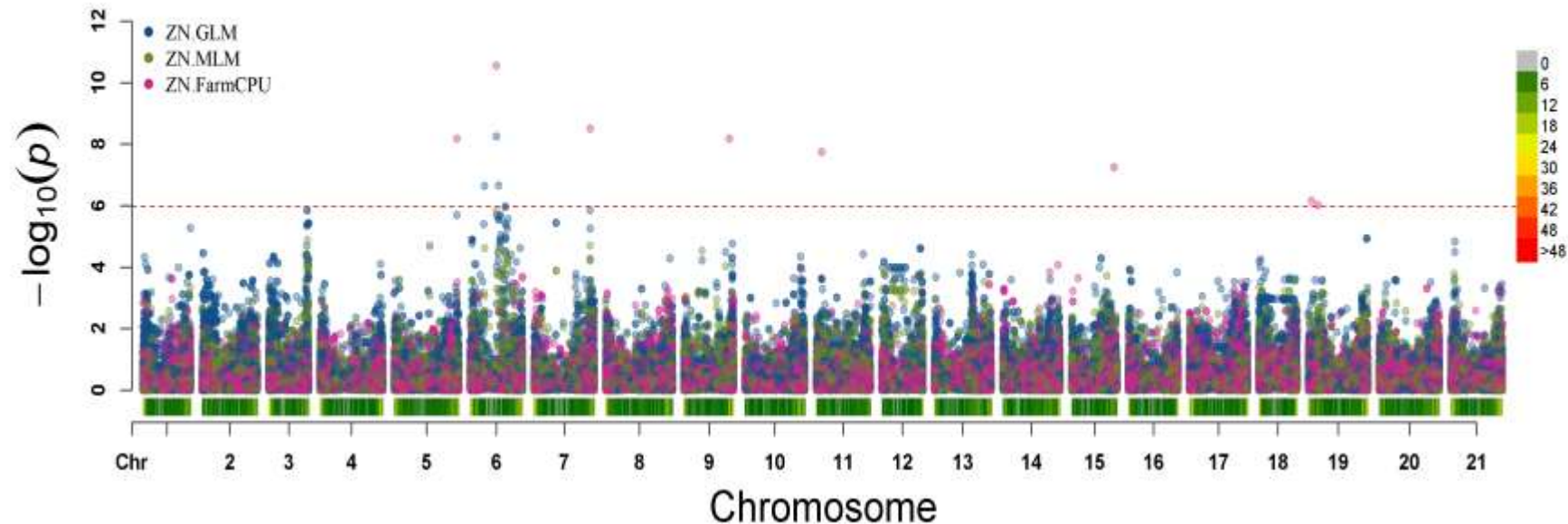
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Distribution of ZN



Manhattan plot of

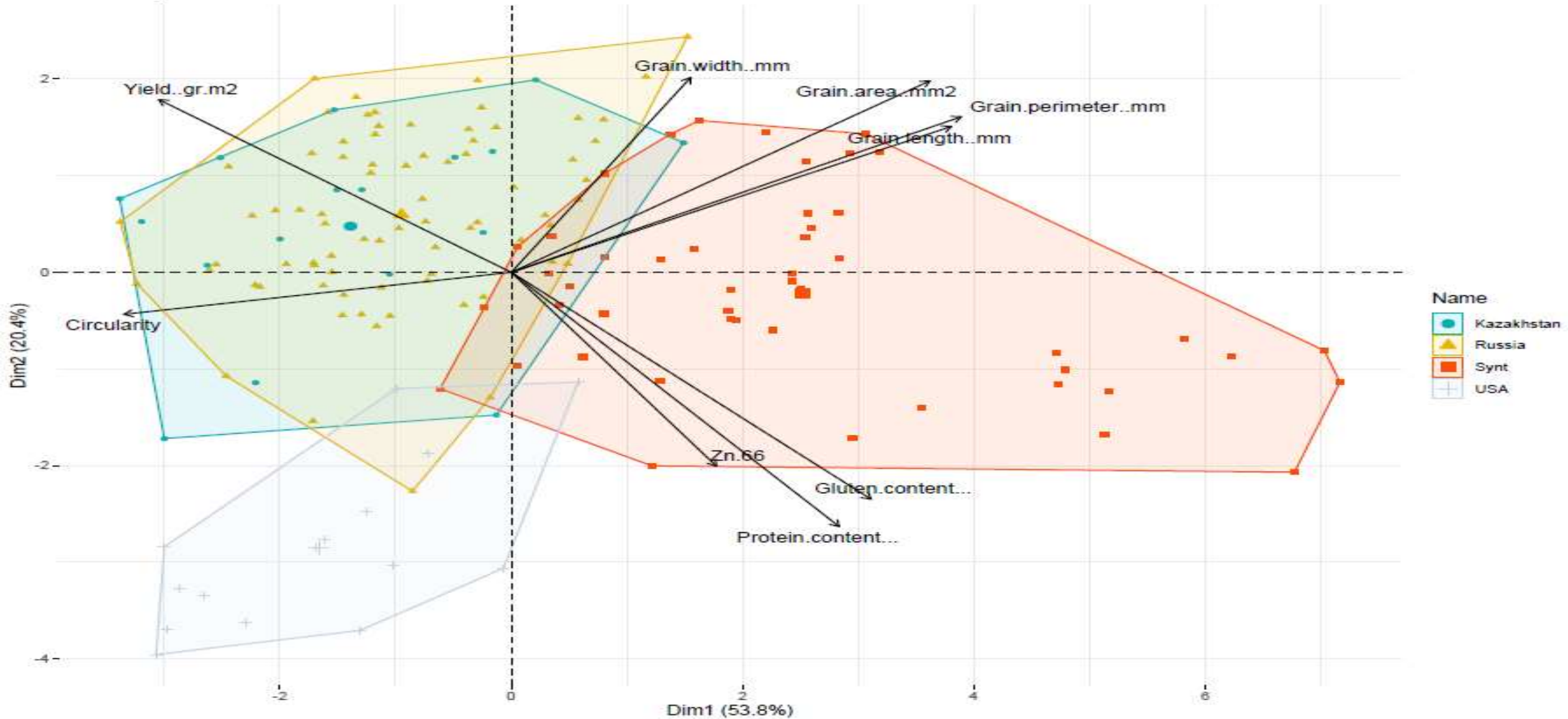


# Material and research methods

- Research GWAS was carried out on the platform iSelect 90K.
- The Zn content in the grain was determined at the Department of Ionomics of the University of Nottingham by atomic adsorption and spectral methods in inductive plasma atomic emission spectrometry (ICP-AES). The preparation of grain samples for multielement analysis was carried out according to the method described by J. Danku et al. (2013). The zinc concentration is calculated in mg per kg of dry matter.
- Field experiments 2 years 2017-2018.
- Material researched 143 sample - synthetic line bread wheat, variety USA, Kazakhstan, Russia.

# Principal component analysis Zn content 2017-18 years

PCA - Biplot



# Sources of high Zn content in grains 2017-18 years

Name	Group	Zn mg/kg
LANGDON/KU-2096	Synthetic wheat	87.3
UKR-OD 1530.94/AE.SQUARROSA(392)	Synthetic wheat	87.1
UKR-OD 1530.94/AE.SQUARROSA(392)	Synthetic wheat	79.4
LANGDON/KU-2105	Synthetic wheat	76.1
LANGDON/KU-2093	Synthetic wheat	74.3
Freyer	USA variety	72.5
AISBERG/AE.SQUARROSA(511)	Synthetic wheat	67.8
LANGDON/KU-2092	Synthetic wheat	66.5
UKR-OD 1530.94/AE.SQUARROSA(310)	Synthetic wheat	66.3
UKR-OD 1530.94/AE.SQUARROSA(1027)	Synthetic wheat	65.3

# GWAS result Zn content in grains 2017-18

## ( $p \leq 1 \times 10^{-6}$ )

SNP	Genes	Chromosome	p	Percent material researched	Effect mg/kg
2017					
S1D_22099159	-	1D	3.68E-06	14,1	11.2
S7A_287882406	-	7A	3.97E-06	27,2	9.9
S5A_478857359	TraesCS5A02G267500	5A	8.45E-06	23,1	8.5
S2B_213037042	-	2B	9.83E-06	32,3	8.6
2018					
S7B_374441352	-	7B	1.35E-06	5,6	35.9
S2D_35548157	-	2D	5.67E-06	6,2	21.7
S6B_584715980	-	6B	6.05E-06	7,3	20.3
S5A_554563813	-	5A	8.78E-06	7,3	41,0
S2D_30935042	TraesCS2D02G073600	2D	8.92E-06	5,8	15,0
S2D_646433883	-	2D	9.39E-06	13,9	13,7
S4A_686579282	-	4A	9.83E-06	7,7	38.2

# Conclusions

- With  $p=1 \times 10^{-6}$  no SNP recurrences were found over 2 years of research, with  $p=1 \times 10^{-4}$  7 SNP recurred 2 years in a row: S1D\_481791231, S6A\_597841993, S6D\_451861634, S6D\_451861645, S6D\_451861651, S6D\_451861655, S6A\_597692159.
- 127 SNPs recurred 2 years in a row at  $p=0,05$ . A genome – 49 SNP, B genome – 36, D genome – 38.
- For breeding to increase the zinc content in grain, synthetic wheat can be recommended. Variety USA Freyer, RB07, Tom, SY TYRA - Zn content > 60 mg/kg, best Russian variety Silach=59,6 mg/kg, Lut. 87-12 =56,5 mg/kg; best Kazakhstan variety Stepnaya 253 = 54,2 mg/kg.
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