



4th ICC Latin America Cereals Conference

13th International Gluten Workshop

11-17 March 2018

Mexico City, Mexico

DEVELOPMENT OF WHEAT GENOTYPES WITH HIGH BISCUIT-MAKING QUALITY AND EVALUATION OF BISCUIT-MAKING QUALITY OF LANDRACES

This study is a part of a project funded by TUBITAK (214O050)



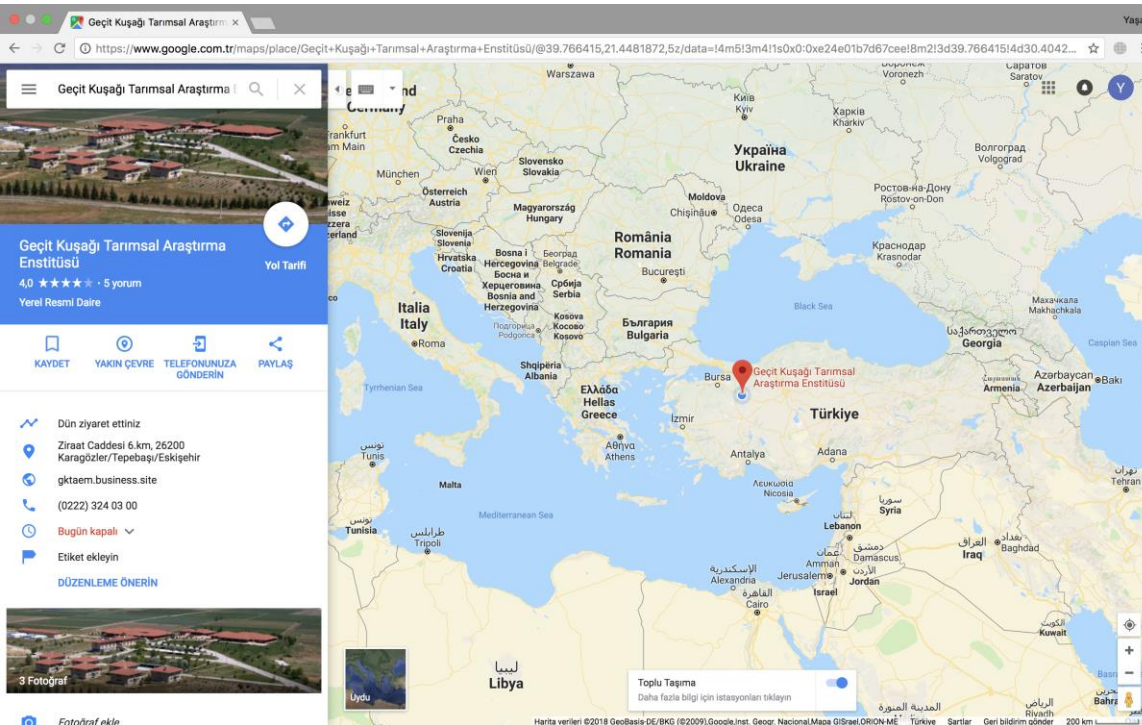
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Turkey is one of the leading wheat producers of the world with around 20 million ton annual production (3% of total World production-IGC, 2016).



Year	Area (million Ha)	Production	Yield
2007	8.098	17.234	2.167
2008	8.090	17.782	2.345
2009	8.100	20.600	2.566
2010	8.103	19.674	2.440
2011	8.096	21.800	2.704
2012	7.530	20.100	2.672
2013	7.726	22.050	2.845
2014	7.919	19.000	2.429
2015	7.867	22.600	2.872
2016	7.672	20.600	2.710

Turkish Grain Board, 2017

Aproximately 70% of planting areas of TURKEY is the Winter Wheat Production Areas (WWPA).
(Sowing period October-November and Harvesting on June-July)

Our Institute, TZARI, carries out its studies for WWPA

Biscuit sector creates the most value added among the grain based industry.

There are 30 biscuit-producing company produces 408.000 tones biscuits and cakes (TSI 2017)

Turkey's share in world biscuit trade is aproximately 3,5%.

Of the total bakery products exported by our country is with 60% biscuits and cakes



There is a need for wheat varieties that can be used for biscuit industry.

The sector has searched wheat for appropriate quality.



AIMS

- (i) Development of new soft wheat varieties for irrigated and rainfed conditions
- (i) Screening our local wheat genetic resources and transferred to breeding programs.

Project is divided in two sub-groups

- I. Development of Wheat Genotypes with High Biscuit-making Quality
- II. Evaluation Of Biscuit-making Quality Of Landraces

1. Development of Wheat Genotypes with High Biscuit-making Quality

MATERIAL	
Rainfed	20 lines ve 5 standarts (Carisma, Artico, Bayraktar, Karahan, Gerek)
Irrigated	20 lines ve 5 standarts (Carisma, Artico, Cetinel, Eser, Göksu)
LOCATION	
Rainfed	7 locations (Eskisehir, Konya, Çumra, Hamidiye, Amasya, Kütahya, Gözlü)
Irrigated	5 locations (Eskişehir, Edirne, Konya, Sakarya, Samsun)
YEAR	3
TRIAL DESIGN	Randomized Complete Block Design (RCBD) 4 replications



February ; Not any emergency
Still in soil-2nd year



May: Heading time not enough
Plant height and less tillering-1 st year

1. Development of Wheat Genotypes with High Biscuit-making Quality

Wheat Morphological/Phenological Measurements



Cold Tolerance-early spring



logging



Heading date-late spring



Plant Height

1. Development of Wheat Genotypes with High Biscuit-making Quality

DISEASES

YELLOW RUST



STEM RUST



1. Development of Wheat Genotypes with High Biscuit-making Quality

QUALITY TESTS



SKCS



NIR Spec.



LECO-



SRC Tests



Break and Flour Yield



GlutoPeak



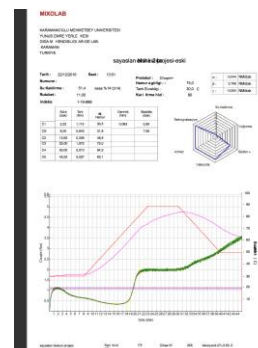
Mixolab



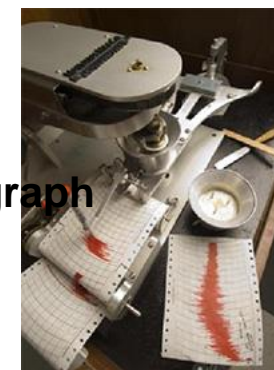
Falling Number



Nilemalitre



mixograph



TWO Targeted Biscuit Type

Private Company Research Laboratories



Baby biscuit-reference
weak gluten quality



Petit Beurre-reference
weak gluten quality

Baking-185 C, 8 min
210 ° C, 8 min

Dimension measurement

Texture measurement

Sensory evaluation

Sedim < 21,0 ml
WGLu < 24%
Dam starch 24 UCD
Hardness 1646 gF
Suitable dimensions

RESULTS

Promising Lines and Standarts Avarage Quality Parameters in Rainfed Conditions 2 years and 14 locations

Year		Sno	KW	DIAM	BFY	FY	SI	PROT	ZEL	BEM	PM	ENG	SRC-W	SRC-SAC	SRC-LAC	STAB	C2
2016	4-B	1	34,39	2,77	28,35	56,69	25,30	11,01	33,19	44,43	28,24	1058,42	54,30	80,51	119,80	5,65	0,426
2016	Gerek	2	31,92	2,65	28,84	58,17	33,05	11,02	28,57	50,21	31,12	1199,70	55,48	81,43	107,66	4,74	0,348
2016	6-F	3	39,24	2,82	28,54	58,37	28,02	11,26	40,33	46,40	30,29	1134,04	56,69	81,94	125,19	7,45	0,467
2016	7-E*	4	34,49	2,64	31,00	58,59	27,57	11,03	21,24	42,52	26,05	930,75	52,87	76,38	83,58	2,24	0,262
2016	Carisma	5	29,78	2,55	28,57	58,58	33,76	10,78	25,24	37,98	24,43	899,06	55,32	79,23	104,69	3,75	0,349
2016	Bayraktar	6	35,19	2,76	27,71	57,41	26,76	10,94	34,29	42,48	28,05	1059,63	52,99	77,25	116,27	7,39	0,488
2016	16-A*	7	32,43	2,66	31,52	58,33	26,73	11,01	31,81	35,35	23,51	875,05	53,20	79,82	106,90	5,56	0,378
2016	Artico	8	28,67	2,52	32,57	58,49	25,49	10,94	35,48	44,88	28,86	1068,80	53,29	80,26	125,57	6,54	0,437
2016	21-C*	9	33,93	2,69	27,16	58,05	29,53	10,83	27,62	39,95	26,83	967,22	54,27	77,08	105,62	4,73	0,391
2016	24-D*	10	33,19	2,67	29,95	55,79	25,25	11,01	24,67	36,95	24,17	887,92	55,64	81,78	98,91	2,87	0,321
2016	Karahan	11	32,96	2,65	27,88	58,15	33,37	11,21	39,29	46,95	29,90	1148,34	56,26	85,59	127,79	6,87	0,441
2017	4-B	1	36,56	2,84	29,36	58,35	25,82	10,85	34,73	40,57	27,71	995,94	50,97	75,97	114,93	6,17	0,459
2017	Gerek	2	32,95	2,68	29,47	58,47	34,81	10,54	29,67	41,48	27,07	1019,49	51,55	75,87	107,92	4,93	0,405
2017	6-F	3	38,85	2,81	29,06	57,70	30,95	10,69	37,60	41,40	27,64	1026,85	52,57	76,94	117,09	7,11	0,500
2017	7-E*	4	34,79	2,67	31,39	58,95	30,40	10,48	21,07	39,36	25,55	890,94	49,89	73,04	83,06	2,00	0,330
2017	Carisma	5	29,63	2,55	29,12	58,08	37,54	10,42	28,07	34,79	22,79	835,37	52,32	76,69	100,87	3,71	0,396
2017	Bayraktar	6	35,98	2,79	28,89	58,35	31,80	10,15	31,80	37,29	25,55	964,18	50,63	73,58	109,84	8,01	0,469
2017	16-A*	7	33,16	2,68	32,19	57,98	29,49	10,48	33,00	31,83	20,71	792,91	50,16	76,91	106,40	5,94	0,447
2017	Artico	8	29,20	2,54	32,56	58,69	29,84	10,46	34,40	38,67	24,50	925,51	49,49	75,84	114,68	5,48	0,394
2017	21-C*	9	33,44	2,66	29,16	57,50	29,62	10,41	27,13	35,64	22,17	905,64	50,15	73,76	104,64	6,09	0,413
2017	24-D*	10	34,83	2,74	31,65	56,41	25,24	10,26	23,27	31,90	20,71	761,14	51,96	76,87	96,96	3,14	0,382
2017	Karahan	11	34,56	2,69	27,80	56,63	35,53	10,69	39,33	36,60	25,45	945,64	52,20	80,65	121,63	7,43	0,450

A

good



D

good



E

good



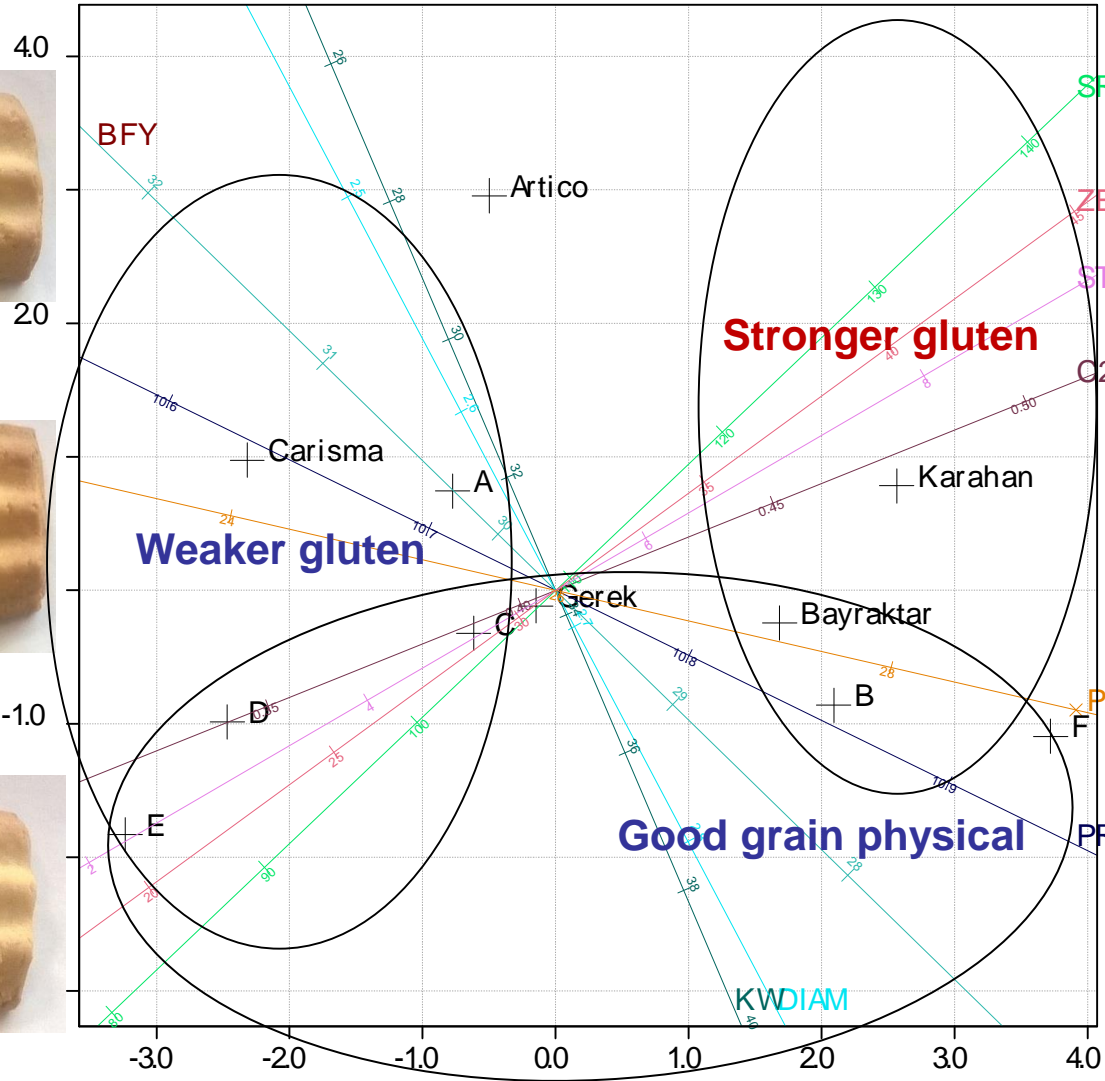
C

Not good

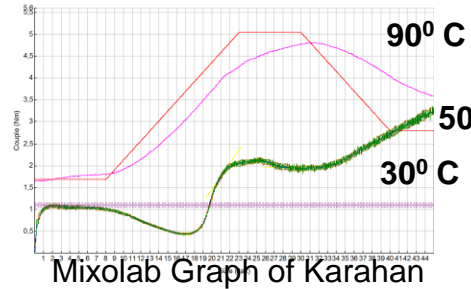


Rainfed-Bis Yield Trial (Quality Results-2 years 14 loc)

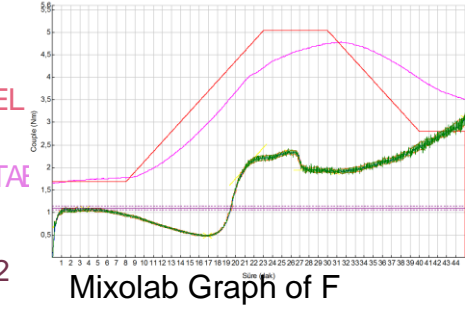
PCP biplot (75.72%)



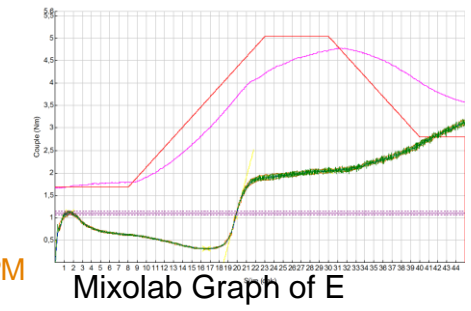
PC-1 (56.49%)



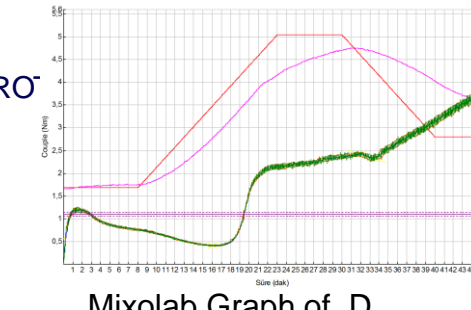
Mixolab Graph of Karahan



Mixolab Graph of F



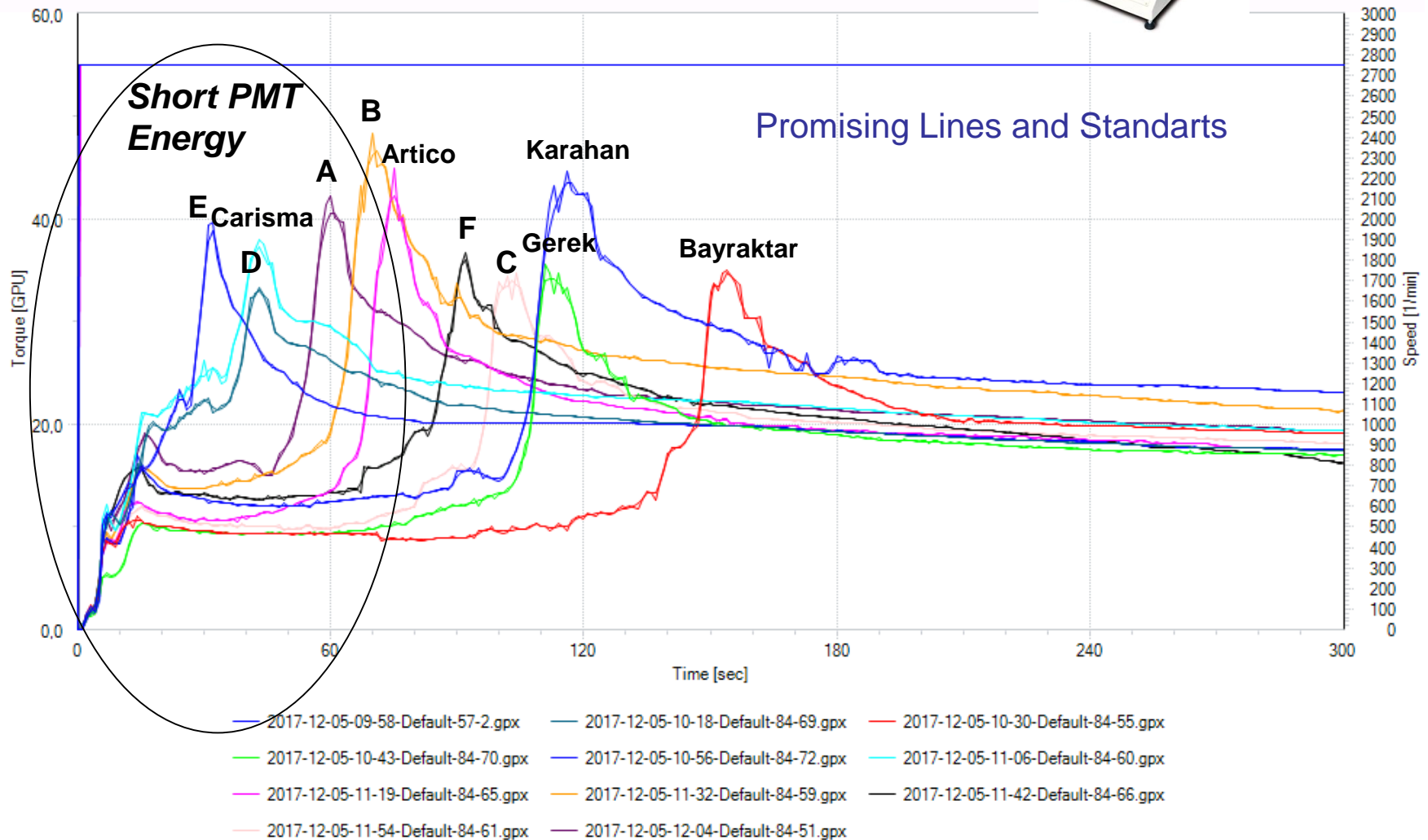
Mixolab Graph of E



Mixolab Graph of D
12

Rainfed-Bis Yield Trial

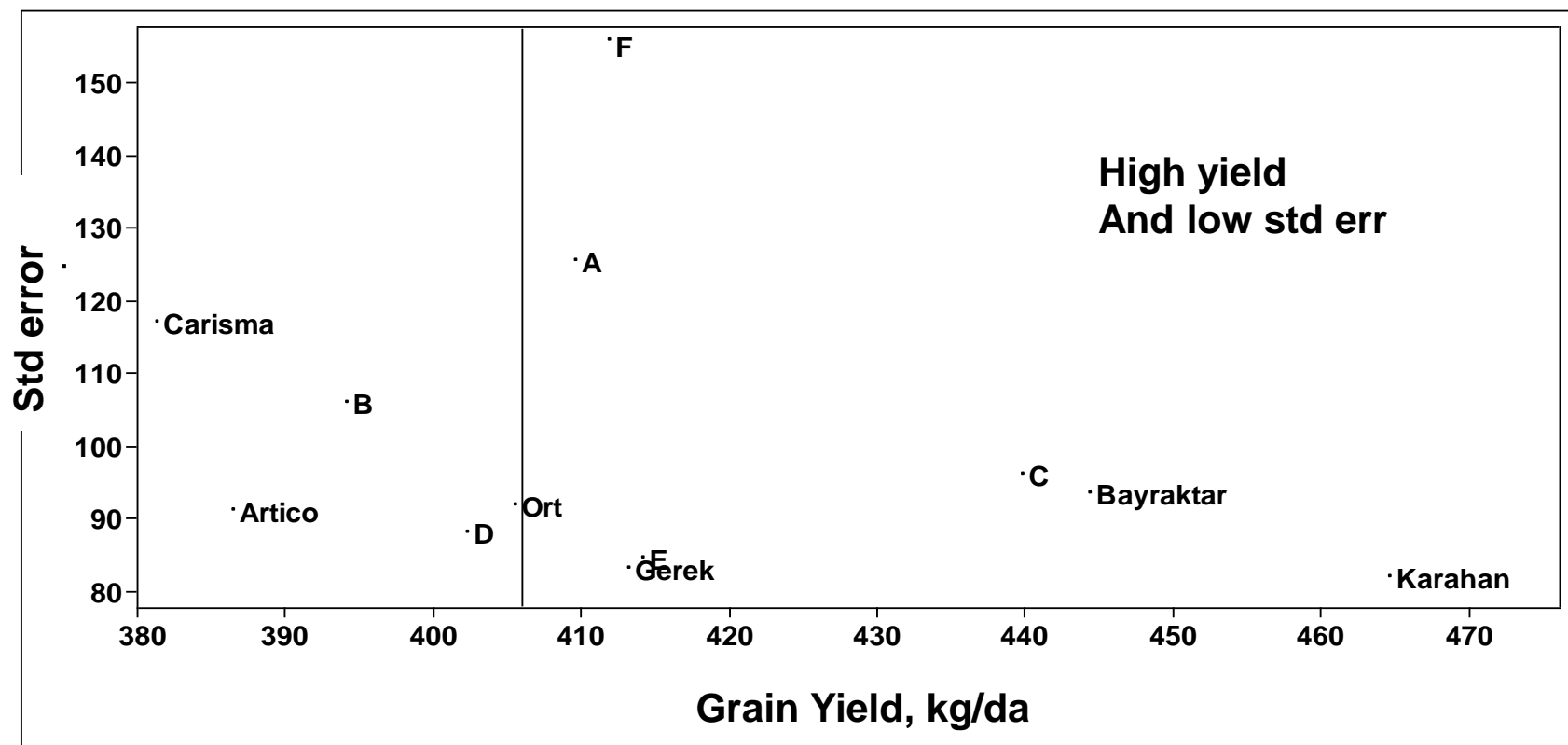
GlutoPeak-



Rainfed-Bis Yield Trial

A, E, C, D

7 loc. ave.



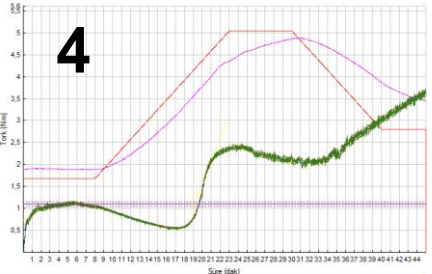
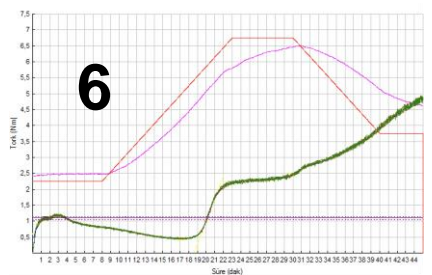
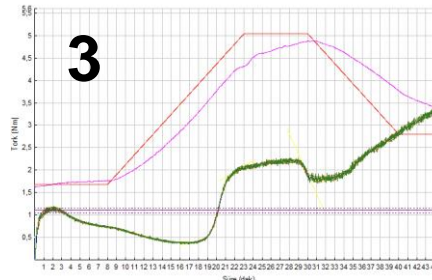
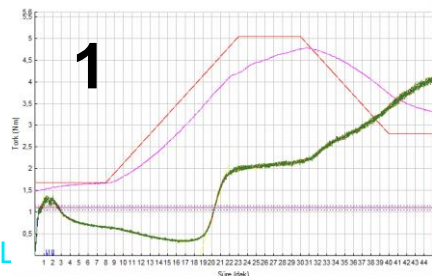
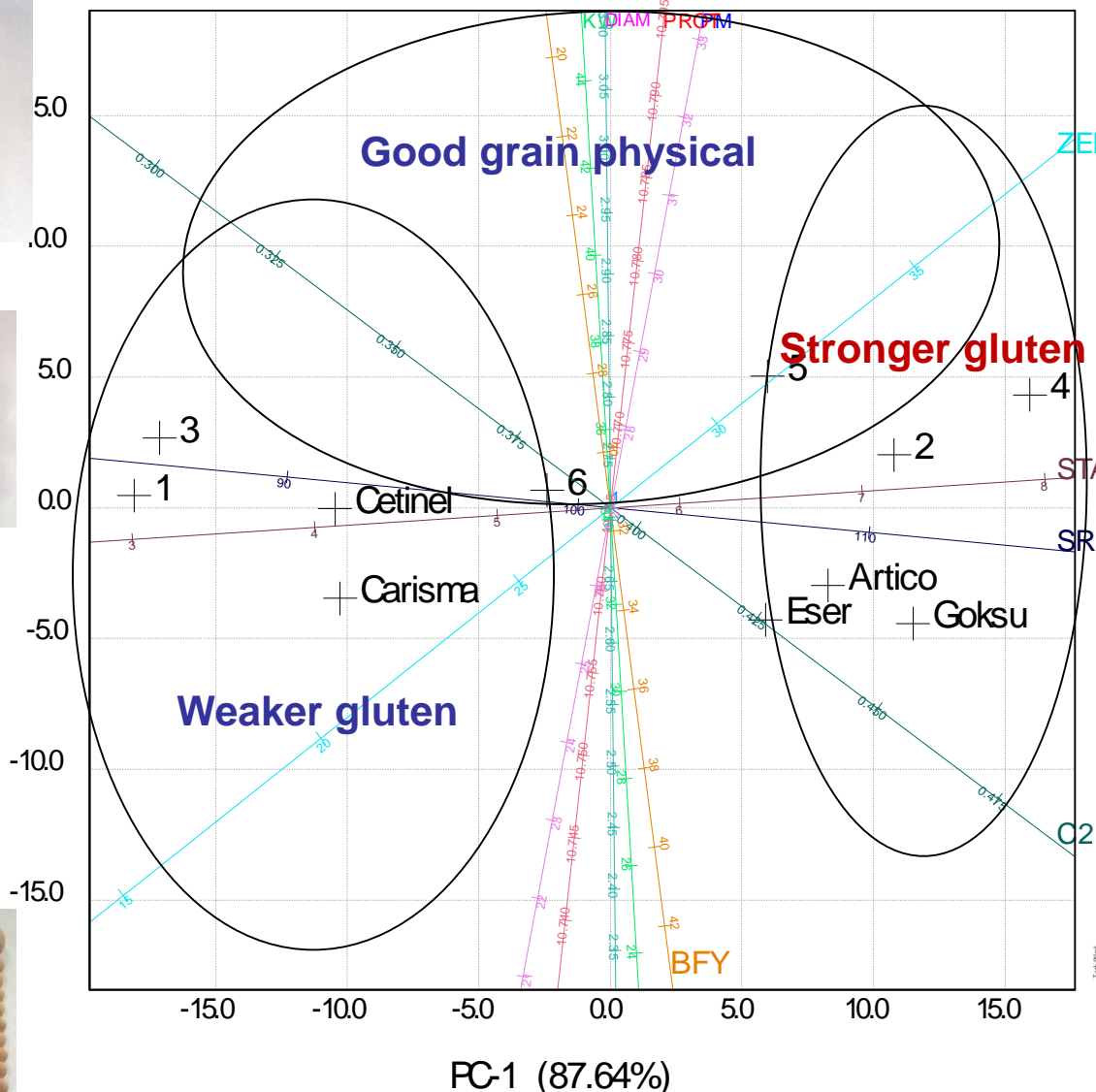
Promising Lines and Standarts Some Quality Parameters in Irrigated Conditions 2 years and 10 locations

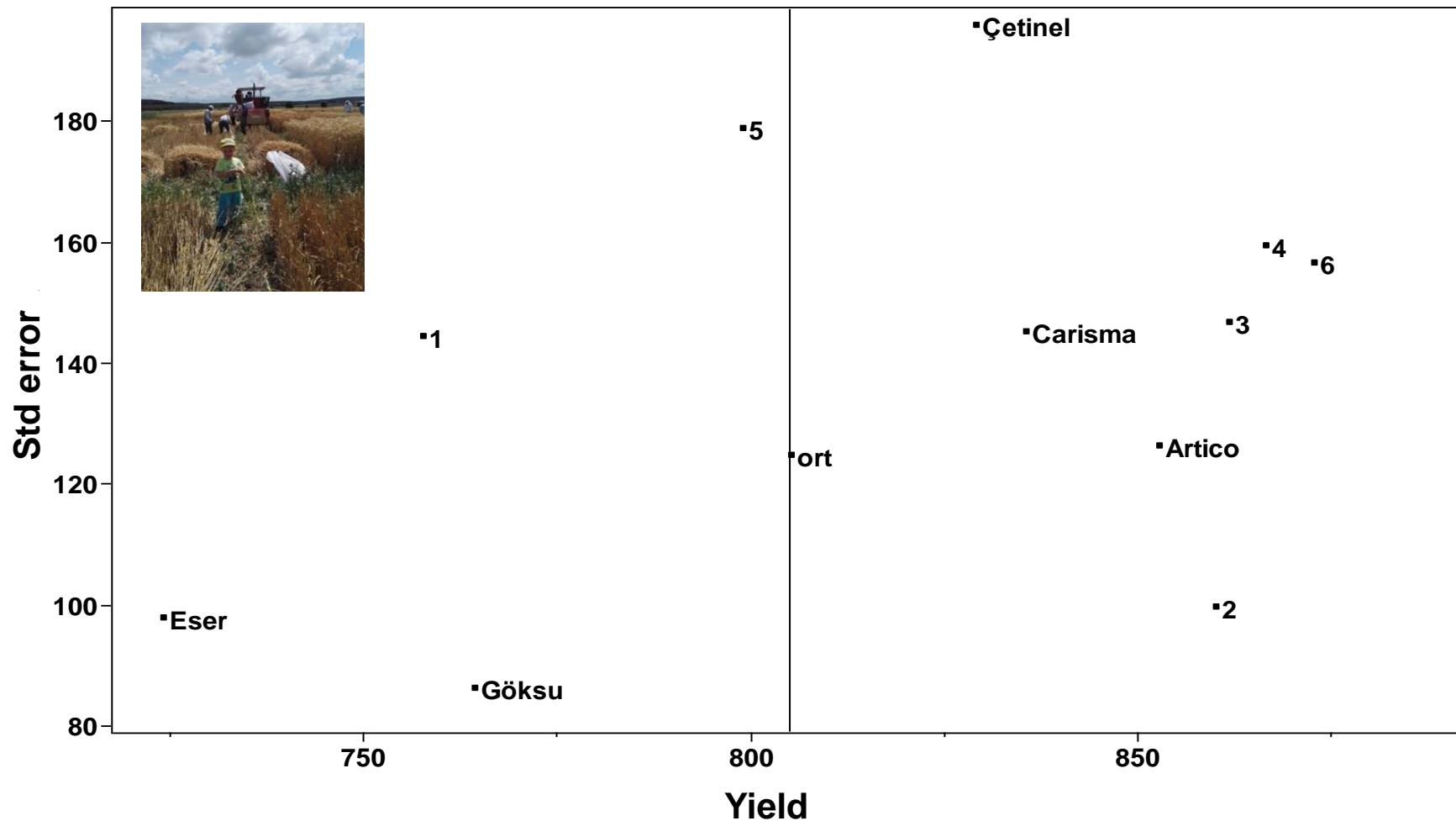
Year		Sno	KW	DIAM	BFY	FY	SI	PROT	ZEL	BEM	PM	Enerji	SRC-W	SRC-SAC	SRC-LAC	STAB	C2
2016	1-5	1	32,56	2,67	29,05	60,55	44,77	10,40	35,07	43,07	28,88	1000,8	60,83	79,35	102,5	7,22	0,474
2016	Çet	2	31,63	2,59	31,25	56,99	36,69	10,43	23,13	50,21	31,12	972,49	59,11	81,09	94,64	5,36	0,349
2016	7-6*	3	33,13	2,68	31,08	54,71	29,91	10,57	27,80	42,52	26,05	829,33	56,98	84,61	98,75	4,74	0,324
2016	9-4	4	35,62	2,80	29,91	58,56	28,88	10,56	34,80	46,98	30,95	1013,0	57,52	84,36	116,9	7,81	0,421
2016	Car	5	29,52	2,55	30,85	54,19	32,72	10,36	23,67	37,98	24,43	781,22	56,75	79,60	95,80	5,36	0,424
2016	11-2	6	33,14	2,71	28,93	59,17	29,50	10,35	33,80	44,10	29,90	1007,3	57,16	80,78	111,5	8,55	0,439
2016	Eser	7	28,57	2,52	37,24	58,65	22,25	10,70	31,53	42,48	28,05	887,20	55,02	78,82	104,6	7,62	0,435
2016	18-1*	8	33,38	2,70	30,71	57,24	27,76	10,61	20,93	43,40	28,02	874,24	56,15	78,38	86,64	2,36	0,281
2016	Artico	9	29,49	2,58	33,05	54,96	27,03	10,41	29,13	44,88	28,86	902,70	55,53	81,45	114,0	4,87	0,370
2016	23-3*	10	30,66	2,60	28,05	58,42	36,86	10,29	19,47	52,79	32,88	926,60	57,81	79,37	85,32	3,77	0,323
2016	Göksu	11	28,46	2,54	35,74	56,08	29,10	10,42	28,40	46,95	29,90	914,43	57,84	77,62	110,3	8,32	0,487
2017	1-5	1	39,26	2,87	28,47	56,28	42,63	11,10	33,50	42,40	27,03	1050,1	56,89	74,57	106,6	7,64	0,439
2017	Çet	2	38,74	2,80	31,22	57,36	33,68	10,87	19,83	36,17	25,40	963,80	53,32	75,10	89,77	3,90	0,362
2017	7-6*	3	37,82	2,82	31,67	57,15	26,97	11,11	28,25	37,30	24,53	876,56	53,31	77,94	98,12	4,41	0,354
2017	9-4	4	39,95	2,91	30,37	55,69	23,67	11,04	31,50	41,73	27,57	1049,0	53,58	76,67	115,3	6,81	0,424
2017	Car	5	34,18	2,69	30,29	53,55	29,28	10,67	19,42	31,83	20,70	775,97	55,02	75,04	89,50	4,49	0,439
2017	11-2	6	35,35	2,75	30,89	58,25	24,49	10,96	29,42	39,50	26,90	993,03	54,12	76,34	110,3	6,96	0,422
2017	Eser	7	34,67	2,72	36,03	57,68	19,17	11,18	30,00	38,90	25,40	955,62	53,00	75,84	106,2	5,58	0,384
2017	18-1*	8	40,63	2,91	31,33	56,82	24,69	11,22	20,33	36,60	21,97	823,60	52,62	73,34	82,93	1,87	0,335
2017	Artico	9	34,48	2,70	33,32	58,09	21,65	10,94	27,92	39,67	24,37	940,38	49,80	74,18	105,4	4,86	0,410
2017	23-3*	10	38,46	2,84	26,71	55,93	34,76	11,37	21,33	43,63	25,97	1008,8	53,35	75,68	86,11	2,93	0,320
2017	Göksu	11	32,95	2,67	34,82	56,52	26,69	11,27	31,83	38,97	25,13	969,68	53,62	74,42	113,1	8,20	0,463

Irrigated-Bis Yield Trial

(Quality Results-2 years 10 loc)
PCP biplot (94.42%)

Mixolab Graphs

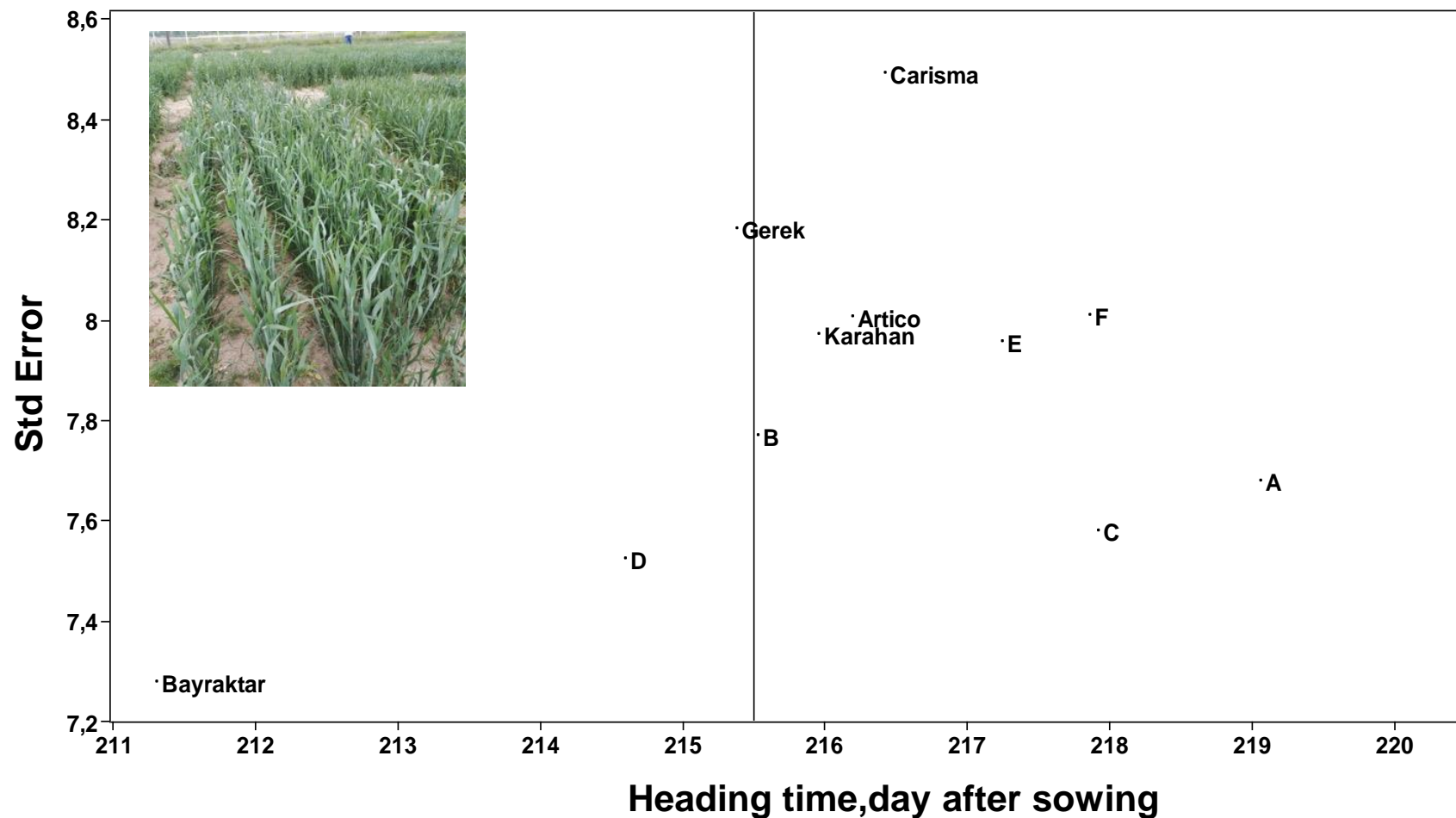




Rainfed-Bis Yield Trial

A, E, C, D

7 loc. average



Rainfed-Bis Yield Trial

Yellow rust

	ESKİŞEHİR				HAMİDİYE				KONYA	
	2016-2017		2015-2016		2016-2017		HGB 2016-2017			
	DS RT	EC	DS RT	EC	DS RT	EC	DS RT	EC		
B	0 R	0,2	30 MR	12,0	0 R	0,2	20 S	20	MR	
Gerek	0 R	0,2	10 MS	6,0	80 S	80	60 S	60	S	
F	0 R	0,2	0 R	0,2	0 R	0,2	0 R	0,2	R	
E*	10 MS	6,0	20 MS	12,0	5 MR	2	60 MS	48	MR	
Carisma	0 R	0,2	40 MS	32	0 R	0,2	20 S	20	MR	
Bayraktar	0 R	0,2	0 R	0,2	30 S	30	60 S	60	MS	
A*	0 R	0,2	0 R	0,2	0 R	0,2	60 MS	48	MS	
Artico	0 R	0,2	0 R	0,2	0 R	0,2	10 MS	6	R	
C*	0 R	0,2	5 MR	4,0	0 R	0,2	0 R	0,2	R	
D*	10 MS	6,0	60 MS	48,0	0 R	0,2	60 MS	48	MS	
Karahan	60 MS	48	10 MR	4	10 S	10	40 S	40	MS	

DS:Disease severity

EC:Enfection coefficient

MD:Medium resistant

S.Sensitivity

R:Resistant

MS:Medium sensitivity



Irrigated-Bis Yield Trial

Yellow rust

	ESKİŞEHİR				EDİRNE		SAKARYA		KONYA		
	2016-2017		2015-2016		2015-2016		2015-2016		HGB 2016-2017		
	DS RT	EC	DS RT	EC	DS RT	EC	DS RT	EC	DS RT	EC	
5	0 R	0,2	0 R	0,2	20 S	20	10 S	10	0 R	0,2	R
Çetinel	0 R	0,2	10 MR	4	0 R	0,2	20 S	20	40 MS	24	MR
6	60 S	60	5 MR	2	0 R	0,2	10 S	10	20 S	20	MS
4	0 R	0,2	0 R	0,2	30 S	30	0 R	0,2	0 R	0,2	MR
Carisma	0 R	0,2	80 S	80	10 S	10	80 S	80	0 R	0,2	MS
2	0 R	0,2	0 R	0,2	10 S	10	0 R	0,2	40 MS	24	MR
Eser	0 R	0,2	0 R	0,2	0 R	0,2	0 R	0,2	40 MS	24	MR
1	0 R	0,2	0 R	0,2	10 S	10	60 S	60	60 MS	48	MS
Artico	0 R	0,2	0 R	0,2	0 R	0,2	0 R	0,2	20 MS	12	R
3	0 R	0,2	0 R	0,2	0 R	0,2	0 R	0,2	60 MS	36	MR
Göksu	0 R	0,2	50 S	50	0 R	0,2	10 S	10	80 MS	64	S

DS:Disease severity

EC:Enfection coefficient



MD:Medium resistant
S:Sensitivity
R:Resistant
MS:Medium sensitivity

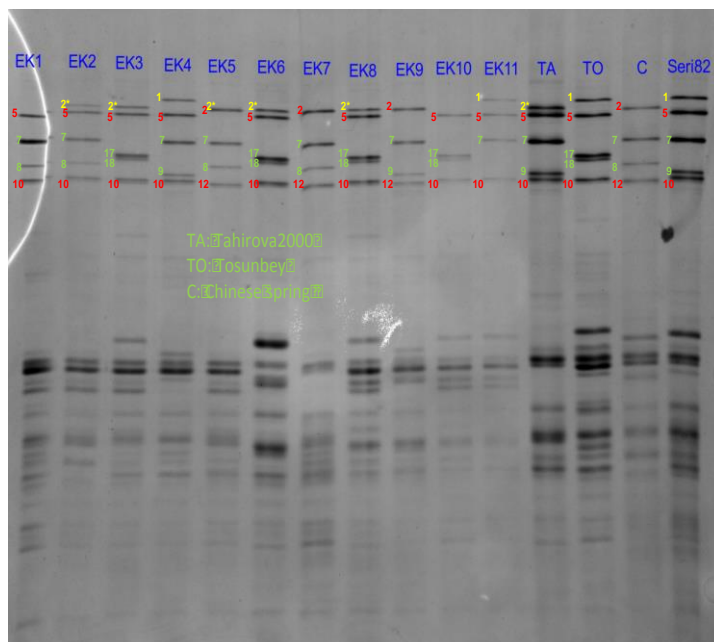
MOLECULAR DATAS

High Molecular Weight
Glutenin Subunits (HMW)

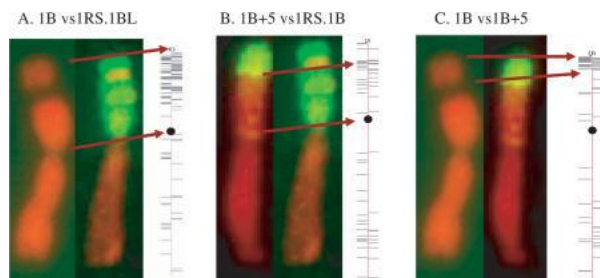
50 lines (rainfed+irrigated conditions)

Wheat-Rye
Translocations

50 lines (rainfed+irrigated conditions)



HMW Glutenin Subunits



Wheat-Rye locations

	YMA-Glu A1	YMA-Glu B1	YMA-Glu D1
B	1	7+9	5+10
Gerek	2*	7+8	2+12
F	2*	17+18	5+10
E*	Null	7+8	2+12
Carisma	Null	7+9	2+12
Bayrakta			
r	2*	7+8	5+10
A	1	7+9	5+10
Artico*	Null	7+8	2+12
C	Null	7+8	5+10
D*	1	7	2+12
Karahan	2*	7+8	5+10

	YMA-Glu A1	YMA-Glu B1	YMA-Glu D1
5	1	7+9	5+10
Çetinel	Null	7	2+12
6	1	7+9	5+10
4	2*	7	5+10
Carisma	Null	7+9	2+12
2	2*	7	5+10
Eser	2*	7	5+10
1*	Null	7+9	2+12
Artico	Null	7+8	2+12
3*	Null	7	2+12
Göksu	2*	7	5+10

Rainfed-Bis Yield Trial

GRAIN AND SPIKE



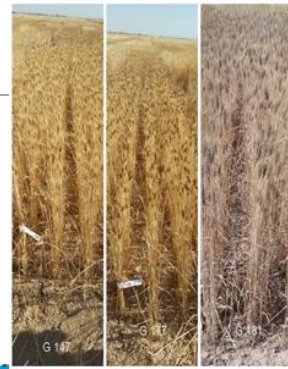
Irrigated-Bis Yield Trial

GRAIN AND SPIKE



II. Evaluation Of Biscuit-making Quality Of Landraces

Landraces Selected from 3000 population collected from FAO project



MATERIAL	
Number	200 landraces and 5 control varieties
Grain Color	White:122 Red: 78
Species	<i>Tr Aestivum</i> :50 <i>Tr. Compactum</i> (Club):150
Collected Regions and Number	East Anatolia: 58 Mediterrenian: 32 Central Anatolia:31 Black Sea:26 Aegean:30 Marmara:6 South-East Anatolia:17

II. Evaluation Of Biscuit-making Quality Of Landraces

LOCATIONS	
Number	1 location (Konya)- 200 landraces with 5 control varieties 3 location (Konya, Cumra ve Gözlü)-selected 20 landraces
YEAR	2 Years-200 landraces with 5 control variety 3 rd year- selected 20 landraces
Trial Design	Augmented -200 landraces with 5 control varieties (10 block) RCBD selected 20 landraces



II. Evaluation Of Biscuit-making Quality Of Landraces

AGRONOMICAL DATAS	
Yield	Grain yield
Morphology/phenology	Spike length, spikelet number, grain number per spike, heading time, cold tol. etc.
Others	General observations (breeder notes)



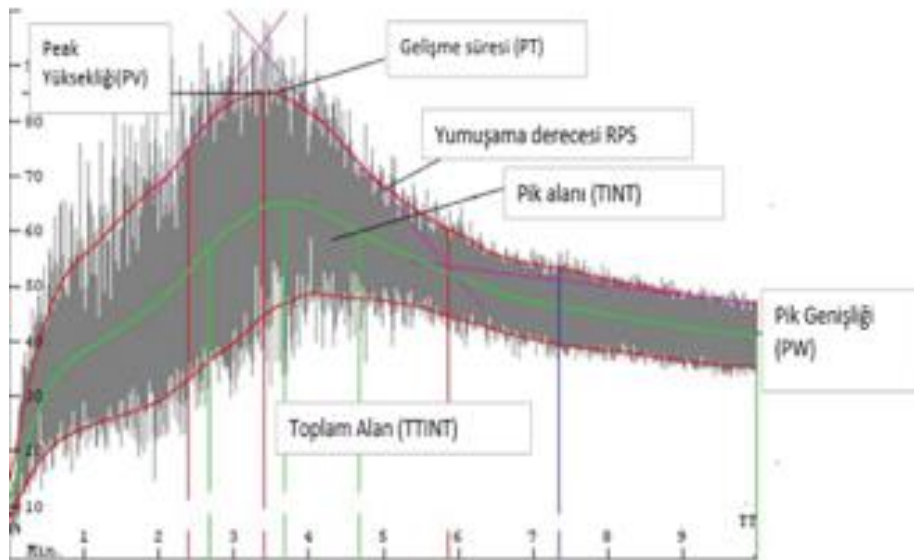
II. Evaluation Of Biscuit-making Quality Of Landraces

YR Disease Observation Nursery



II. Evaluation Of Biscuit-making Quality Of Landraces

QUALITY DATAS	
Grain	Kernel Hardness, Diameter, Moisture and Weight
Flour	Protein content, Zeleny sedimentation test, solvent retention capacity tests-water, sodium carbonate, lactic acid, saccharose
Dough	Rheological parameters-Mixograph



II. Evaluation Of Biscuit-making Quality Of Landraces

Distrubution of 20 Landraces Selected from 200 population of Project material



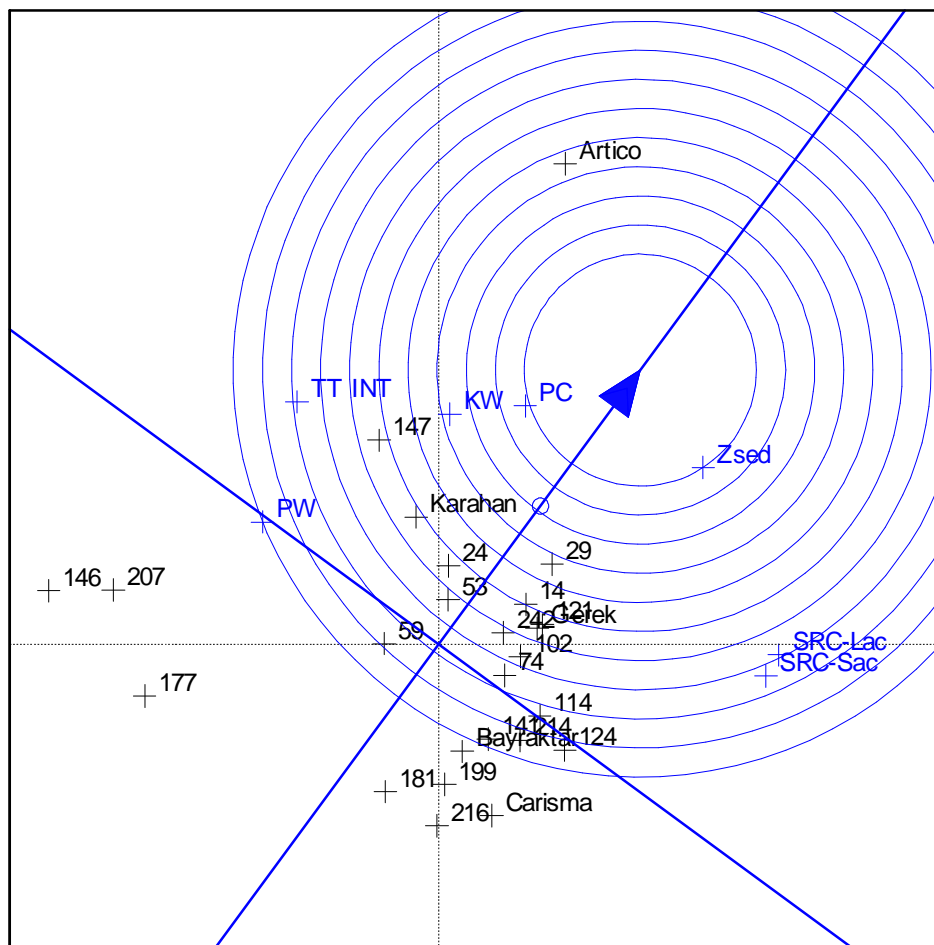
II. Evaluation Of Biscuit-making Quality Of Landraces

Comparison biplot (Total - 65.69%)

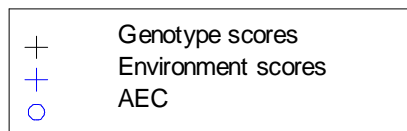
SELECTED LANDRACES

SOME QUALITY PAR.

59, 177, 146, 207, 181
216, 199, Carisma
Bayraktar



PC1 - 40.69%



II. Evaluation Of Biscuit-making Quality Of Landraces

Gen	Cold Tol	Field Score	Spike length (cm)	Spikelet Number	Grain number per Spike	Grain weight per Spike (g)	Plant Height (cm)	Heading time (Day after sowing)	Physiologic maturity (Day after sowing)	Grain yield (t/ha)
14	1,14	8,76	*9,77	14,69	24,49	1,14	78,17	216,40	260,70	4,16
24	1,14	7,76	5,07	14,89	17,29	1,34	82,67	216,40	263,70	3,95
29	0,54	7,76	*9,11	14,85	33,49	1,23	88,37	215,20	264,50	4,44
53	1,14	7,76	*9,75	*17,41	*38,21	1,62	75,97	212,60	262,30	4,52
59	1,14	8,76	6,95	14,81	33,41	1,21	82,47	213,60	262,30	*4,59
74	1,14	5,76	4,47	13,61	25,81	1,13	78,97	213,60	262,30	4,20
102	1,14	8,16	5,30	14,69	26,05	1,23	86,57	213,60	263,10	3,74
114	1,14	9,16	4,80	15,69	29,05	1,20	88,57	211,60	263,10	4,16
121	1,14	7,16	4,60	13,49	22,45	1,02	82,57	213,60	259,10	4,14
124	2,14	8,16	4,66	14,09	25,65	1,03	89,07	214,60	258,10	4,53
141	1,10	7,00	4,46	15,13	26,69	1,04	89,07	213,80	261,30	4,47
146	1,14	6,96	5,16	15,13	30,89	1,24	87,57	212,80	*261,30	4,19
147	1,14	6,96	5,56	16,13	28,09	1,26	86,07	213,80	260,30	4,35
177	0,94	6,96	4,69	13,25	29,69	1,05	70,47	212,40	263,50	3,66
181	0,94	7,96	6,49	15,65	30,49	1,28	84,47	212,40	263,50	4,15
199	0,94	6,96	4,99	*16,65	29,69	1,13	68,97	213,40	*268,50	3,71
207	1,14	7,56	5,36	15,41	30,97	1,34	87,77	213,00	*261,50	4,17
214	1,14	8,56	4,98	15,41	33,17	1,26	87,77	214,00	262,50	3,86
216	2,14	7,56	4,26	16,21	31,97	1,40	78,77	214,00	262,50	4,18
242	0,94	7,96	6,00	15,09	30,73	1,23	85,67	212,40	263,50	4,98
Artico	1,00	7,50	7,46	14,60	27,46	1,19	77,50	210,00	261,50	3,86
Bayraktar	1,10	8,10	7,80	14,68	28,78	1,07	70,00	206,90	259,50	4,56
Carisma	1,20	6,30	7,54	17,04	42,78	1,44	58,40	211,10	260,80	3,44
Gerek	1,20	7,60	7,75	14,94	30,40	1,14	73,50	210,90	260,10	4,58
Karahan	1,20	7,30	9,39	15,80	33,42	1,37	77,95	212,20	260,80	4,67

II. Evaluation Of Biscuit-making Quality Of Landraces

Genotype	Species	Variety name (local)	Grain color	Spike (Awny/Awnless)	Yellow rust	Stem rust	Glu-A1	Glu-B1	Glu-D1
14	Tr. Aest	Kocabugday	Red	Awny	0	0	null	6+8	2+12,2
24	Tr. Aest	Rus Bugdayı	Red	Awny	40	40	null	7+8	2+12
29	Tr. Aest	Koy Bugdayı	White	Awny	12	60	2*	7+8	3+12,1
53	Tr. Aest	Asurelık Bugday	White	Awny	40	0	2*	7+8	5+10
59	Tr. Aest	Topbas	White	Awny	100	0	Null	7+8	2+12
74	Tr. Comp	Kırık	White	Awny	40	0	Null	7+8	2+12
102	Tr. Comp	Akbugday	Red	Awny	0	0	Null	7+8	2+12
114	Tr. Comp	Gıcık Bugday	White	Awny	60	60	Null	7+8	2+12
121	Tr. Comp	Calıbasan	White	Awny	20	60	Null	7+8	2+12
124	Tr. Comp	Koy Bugdayı	White	Awny	60	0	Null	6+8	2+12
141	Tr. Comp	Polatlı/Kobak	Red	Awny	40	40	2*	6+8	2+12
146	Tr. Comp	Kunduru	White	Awny	6	60	Null	7+8	2+12
147	Tr. Comp	Menceki	White	Awny	0	20	Null	7+8	2+12
177	Tr. Comp	Kırmızı Topbas	White	Awny	0	100	Null	7+8	2+12
181	Tr. Comp	Kose Bugdayı	Red	Awny	0	0	Null	7+8	2+12
199	Tr. Comp	Agbugday	White	Awny	12	0			2+12
207	Tr. Comp	Malatya Sarı Bursa	White	Awny	60	20			2+12
214	Tr. Comp	Ormece	Red	Awny	80	0			2+12
216	Tr. Comp	Kırmızı Kamcı	White	Awnless	80	0			2+12
242	Tr. Comp	Calıbasan	White	Awny	40	0			2+12
Artico	Tr. Aest		Red	Awnless	60	100	null	7+8	2+12
Bayraktar	Tr. Aest		White	Awny	60	40	2*	7+8	5+10
Carisma	Tr. Aest		Red	Awny	40	0	null	7+9	2+12
Gerek	Tr. Aest		White	Awny	80	40	null	7+8	2+12
Karahan	Tr. Aest		White	Awny	24	40	2*	7+8	5+10

II. Evaluation Of Biscuit-making Quality Of Landraces

Field View of Selected Landraces



59

146



177

181

199

207

216

33

Consequently

In DSWV Sub-Project

4 lines for rainfed
3 lines for irrigated are
promising for registration
After the last year studies
at least one line for
rainfed and one for
irrigated conditions will be
sent to registration trial



The Landraces

Now 20 lines are
promising...
Last year and 3 locations
studies good landraces
are transferred to
breeding programs for
new genetic resources..



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