

DANISH MALTING BARLEY

Catalogue 2022

Introduction

The Danish Preferred Committee welcomes you to the Danish Malting Barley Catalogue. In this catalogue, you will find a short presentation on the varieties which have finished industrial testing.

Further information on the program and full dataset for both Stress- and Industry Test can be accessed via <https://danishpreferred.com/>

Danish Preferred approved varieties

Danish Preferred Approved Varieties			
Variety	Breeder	Year of approval	Page
Evergreen	Nordic Seed	2017	*
KWS Irina	KWS	2017	*
RGT Planet	RAGT	2017	*
Flair	Sejet	2018	6
Laureate	Syngenta	2018	7
Ellinor	Saatzucht Josef Breun	2019	8
Focus	Secobra Recherches S.A	2022	9
Prospect	Sejet	2022	10
Skyway	Nordic Seed	2022	11

*Pre-approved variety – well known and accepted by malting and brewing industry

Short description of program

Preconditions for application:

- Two years results from either Danish Official Testing or Farmer Union Trials.
- Two years of micro malting performed at VLB with samples and application through the Tystofte Foundation.
- Minimum 5 tons of seed available at application.

Stress Test:

- Micro malting from three locations under variable conditions: Steeping degree 45%, 43%, 41%; germination temp. 18/14,5°C; 5 days germination; isothermal mashing at 65 °C.
- The applicants will be invited to present the candidate varieties for the committee and comment on the results from stress test/micro malting.

Industry Test:

- Large scale malting at the two Danish malting companies (Viking Malt and Fuglsang) and one large scale malting at one of the other partners in the program (currently: Avangard Malz, Cargill, Crips Malting Group, Holland Malt, Malteurop, Soufflet)
- Brewing test at three breweries in Denmark or abroad.
- The industry step will have to be completed during either one or two growing seasons.

Final approval:

- Before final approval, a multiplication acreage of 500 hectares is required.

Distribution of Industry Tests

Variety owner and representative

Variety	Breeder	Applicant	Supplier			2021	2022						2023					
				Malting plant	Brewery	Fuglsang, DK	tbd	tbd	tbd	tbd	Carlsberg, SE	Carlsberg, NO	tbd	tbd	tbd	tbd	tbd	tbd
						Fuglsang, DK	Fuglsang, DK	Fuglsang, DK	Fuglsang, DK	Viking Malt, DK	Viking Malt, DK	tbd abroad	tbd abroad	Viking Malt, DK	Viking Malt, DK	Viking Malt, DK	tbd abroad	tbd abroad

Tests to be performed with grain lots from crop 2021 and 2022

CB Score	Carlsberg	Carlsberg	DLG	x					x		x				
----------	-----------	-----------	-----	---	--	--	--	--	---	--	---	--	--	--	--

Tests to be performed with grain lots from crop 2022 and 2023

Gambit	Nordic Seed	Nordic Seed	DLA/Danish Agro		x					x		x			
KWS Thalix	KWS	KWS	Ewers/Hornsyld			x							x		x
LG Flamenco	Limagrain	Sejet	DLG				x							x	x
SY Solar	Syngenta	Syngenta	Ewers					x				x		x	

VARIETY NAME: FLAIR

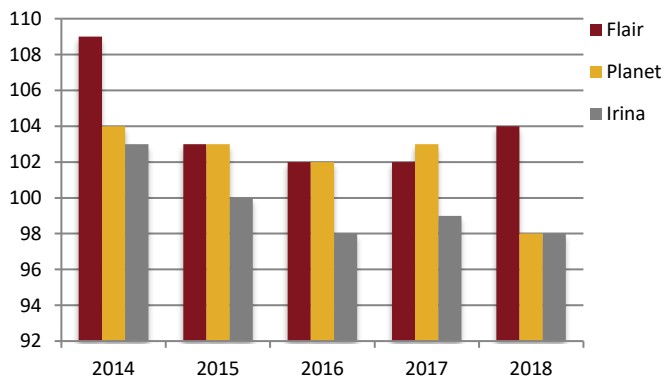


GENERAL INFORMATION

Variety: Flair
 Type: Two row spring malting barley
 Breeder: Sejet, Denmark
 Representative: Sejet, Denmark
 Distributer: DLG
 Pedigree: Dacapo x (Tamtam x Overture)
 Status: 2.680 ha multiplication in DK in 2018
 Geography: DK, SE, PL and ES

AGRONOMY

Data from Danish Official and National trials.
 Relative yield index.



Data from Danish National Trials 2015-2018	Irina/Planet	Flair
Relative yield %	100	103
Protein %	10,9	10,9
Grading >2,5mm %	96	95
Grading >2,8mm %	85	77
Specific weight (hl/kg)	66,7	66,8
Maturity	03 Aug	02 Aug
Straw length in cm	59	58
Lodging (0-10, 1 is best):	0,7	1
Straw breaking (0-10, 1 is best)	3	2,8
Mildew (% coverage)	0	0
Barley rust (% coverage)	12	10
Skald (% coverage)	2,5	4,3
Net Blotch (% coverage)	1,6	0,1

www.sortinfo.dk

VLB MICRO MALTING

Stress test crop 2017 at 41%, 43% and 45% steeping degree. Tested variety is compared to the two largest malting barley varieties in Denmark for crop 2017.

	KWS Irina_45	KWS Irina_43	KWS Irina_41	RGT Planet_45	RGT Planet_43	RGT Planet_41	Flair_45	Flair_43	Flair_41
Extract	3	3	3	3	4	4	2	3	1
Friability	3	4	5	2	3	5	1	2	2
Beta-Glucan	2	4	5	2	3	5	1	1	2
Viscosity	2	3	5	1	2	4	1	1	1
FAN	2	2	3	2	2	3	3	3	2
Soluble N	2	2	3	2	2	3	2	2	2
Kolbach	2	3	3	2	2	3	2	2	2
Alpha-Amylase	4	4	4	1	2	3	1	1	2
Beta-Amylase	1	1	2	1	1	1	2	2	3
Limit Dextrinase	1	2	3	1	2	2	1	1	3
Attenuation	1	2	2	1	1	2	2	4	3
Turbidity	1	2	1	3	4	3	3	3	2

Positive:

- Good extract level at all steeping levels
- Very good malt modification values
- Well balanced proteolytic activity

Negative:

- Low attenuation at steeping degree 43%

INDUSTRY MALTING

Comments to malted barley lots:

- No comments to appearance of barley – however high level of Skinned Grains was noticed as it was often for barley from crop 2017
- High Germination Energy in malted barley lots
- Barley screening >2,8 mm average to slightly low
- Low but still better than average specific weight for barley from Danish crop 2017

Malt results - Positive:

- Well modified malt expressed by good betaglucan level and low viscosity values
- Very high enzymatic level in malt

Malt results - Negative:

- No significant negative values found for tested parameters

INDUSTRY BREWING

Brew house:

- Good lautering/wort collection
- Brewhouse loss in one test reported to be slightly higher than normal

Fermentation and filtration:

- Final Attenuation nicely high
- Good low beer haze
- Good beer filtration

Packaged beer:

- As normal

RECOMMENDATION

Flair is a very high yielding malting barley variety with good agronomic features. Barley grading in terms of grain fraction >2,8 mm could be better. Good modification, high enzymatic level and good Final Attenuation in produced malt and beer.

VARIETY NAME: LAUREATE

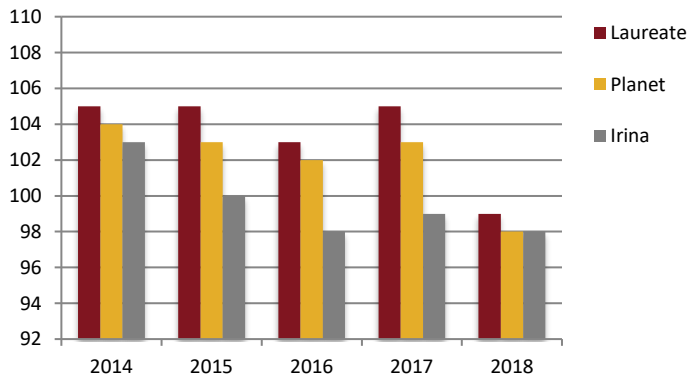


GENERAL INFORMATION

Variety: Laureate, Non GN variety
 Type: Two row spring malting barley
 Breeder: Syngenta, Germany
 Representative: Sejet, Denmark
 Distributer: DLG
 Pedigree: Sanette x Concerto
 Status: 1.152 ha multiplication in DK in 2018
 Geography: DK, UK, SE, FR, PL, DE, IR and LT

AGRONOMY

Data from Danish Official and National trials.
 Relative yield index.



Data from Danish National Trials 2014-2018	Irina/Planet	Laureate
Relative yield %	101	104
Protein %	10,7	10,6
Grading >2,5mm %	97	97
Grading >2,8mm %	86	89
Specific weight (hl/kg)	66,7	66,4
Maturity	02 Aug	02 Aug
Straw length in cm	60	61
Lodging (0-10, 1 is best):	0,6	0,7
Straw breaking (0-10, 1 is best)	3,1	4,1
Mildew (% coverage)	0	0
Barley rust (% coverage)	12	6
Skald (% coverage)	3,4	1,7
Net Blotch (% coverage)	1,3	0,04

www.sortinfo.dk

VLB MICRO MALTING

Stress test crop 2017 at 41%, 43% and 45% steeping degree. Tested variety is compared to the two largest malting barley varieties in Denmark for crop 2017.

	KWS Irina_45	KWS Irina_43	KWS Irina_41	RGT Planet_45	RGT Planet_43	RGT Planet_41	Laureate_45	Laureate_43	Laureate_41
Extract	3	3	3	3	4	4	1	1	3
Friability	3	4	5	2	3	5	2	3	5
Beta-Glucan	2	4	5	2	3	5	2	3	5
Viscosity	2	3	5	1	2	4	1	2	3
FAN	2	2	3	2	2	3	3	3	3
Soluble N	2	2	3	2	2	3	2	2	3
Kolbach	2	3	3	2	2	3	2	2	3
Alpha-Amylase	4	4	4	1	2	3	1	2	3
Beta-Amylase	1	1	2	1	1	1	2	2	2
Limit Dextrinase	1	2	3	1	2	2	2	3	4
Attenuation	1	2	2	1	1	2	1	1	5
Turbidity	1	2	1	3	4	3	2	2	1

Positive:

- Good extract level at all steeping levels
- Good malt modification values

Negative:

- Low attenuation at steeping degree 41%

INDUSTRY MALTING

Comments to malted barley lots:

- No comments to appearance of barley and low level of Skinned Grains compared to general level of crop 2017
- High Germination Energy in all malted barley lots
- Very good screening >2,8 mm
- High Water Sensitivity noticed

Malt results - Positive:

- Generally high extract levels in all trials
- Very high alpha-amylase activity found in one of the trials and better than average beta amylase levels found generally
- High Attenuation

Malt results - Negative:

- Below average malt modification expressed by betaglucan level and friability values

INDUSTRY BREWING

Brew house:

- Very good wort collection reported - Good laureating behavior
- Good extract yield in the brew house reported

Fermentation and filtration:

- As normal

Packaged beer:

- As normal

RECOMMENDATION

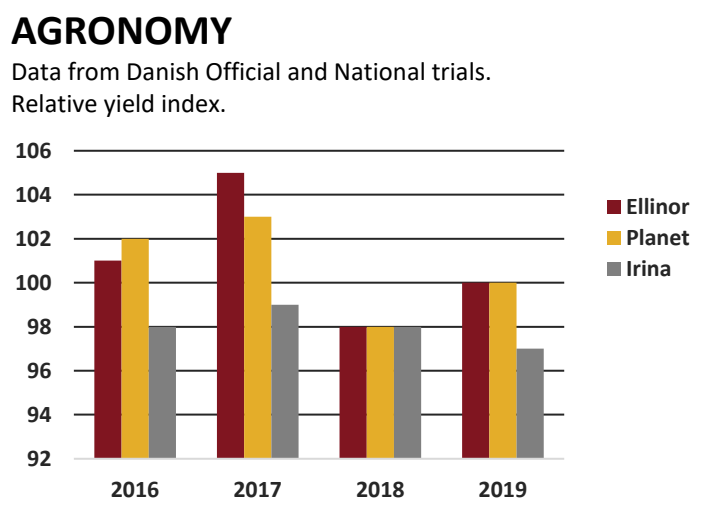
Laureate is a very high yielding malting barley variety with good agronomic features. Barley grading in terms of grain fraction >2,8 mm is good. Laureate was found to be slightly difficult regarding malt modification. Notice that Laureate is a Non-GN variety! Very high enzymatic level and high Attenuation in produced malt. Good brewery performance found through all trials.

VARIETY NAME: ELLINOR



GENERAL INFORMATION

Variety: Ellinor
 Type: Two row spring malting barley
 Breeder: Saatzucht Josef Breun, Germany
 Representative: Nordic Seed, Denmark
 Distributer: DLA
 Pedigree: (Cocerto x Milford) x Quench
 Status: 1.485 ha multiplication in DK in 2019
 Geography: Scandinavia, Baltics, RUS, DE, FR, GB, IT, ES, AT, PL



Data from Danish National Trials 2016-2019	Irina/Planet	Ellinor
Relative yield %	99	101
Protein %	11,5	11,6
Grading >2,5mm %	96	96
Grading >2,8mm %	85	83
Specific weight (hl/kg)	66,9	67,2
Maturity	02-aug	02-aug
Straw length in cm	61	66
Lodging (0-10, 1 is best):	0,8	1,8
Straw breaking (0-10, 1 is best)	3,5	5,4
Mildew (% coverage)	0	0
Barley rust (% coverage)	13	7
Skald (% coverage)	1,9	2,1
Net Blotch (% coverage)	3,3	0,9

www.sortinfo.dk

VLB MICRO MALTING

Stress test crop 2017 at 41%, 43% and 45% steeping degree. Tested variety is compared to the two largest malting barley varieties in Denmark for crop 2017.

	KWS Irina_45	KWS Irina_43	KWS Irina_41	RGT Planet_45	RGT Planet_43	RGT Planet_41	Ellinor_45	Ellinor_43	Ellinor_41
Extract	3	3	3	3	4	4	2	4	5
Friability	3	4	5	2	3	5	2	3	5
Beta-Glucan	2	4	5	2	3	5	2	3	4
Viscosity	2	3	5	1	2	4	2	2	4
FAN	2	2	3	2	2	3	2	2	3
Soluble N	2	2	3	2	2	3	2	2	3
Kolbach	2	3	3	2	2	3	2	2	3
Alpha-Amylase	4	4	4	1	2	3	1	3	3
Beta-Amylase	1	1	2	1	1	1	3	3	3
Limit Dextrinase	1	2	3	1	2	2	3	4	5
Attenuation	1	2	2	1	1	2	3	3	5
Turbidity	1	2	1	3	4	3	1	2	1

- Positive:**
- High extract level at 45% steeping degree
 - Good malt modification values
 - Well balanced proteolytic activity
 - Low wort Turbidity
- Negative:**
- Poor scores for Beta-Amylase, Limit Dextrinase and Attenuation!

RECOMMENDATION

Ellinor is an average to high yielding malting barley variety where the agronomic feature straw breaking need to be observed. Ellinor produces malt of average to good quality. Slightly low final attenuation level found in one of the three produced malts. Generally good performance in full-scale brewery tests.

- ### INDUSTRY MALTING
- Comments to malted barley lots:**
- Healthy barley lots with nice colour reported
 - Very good Germination Energy in malted barley lots
 - Screening >2,8 mm could be better
 - As seen in general for crop 2018 level of Skinned Grains is low
- Malt results - Positive:**
- Nice low betaglucan values were found
 - High Alpha-Amylase activity
 - Good friability values in malted lot with low protein level
- Malt results - Negative:**
- Final attenuation was found to be average to low in two of the three malt batches
 - Average/low Beta-Amylase activity found

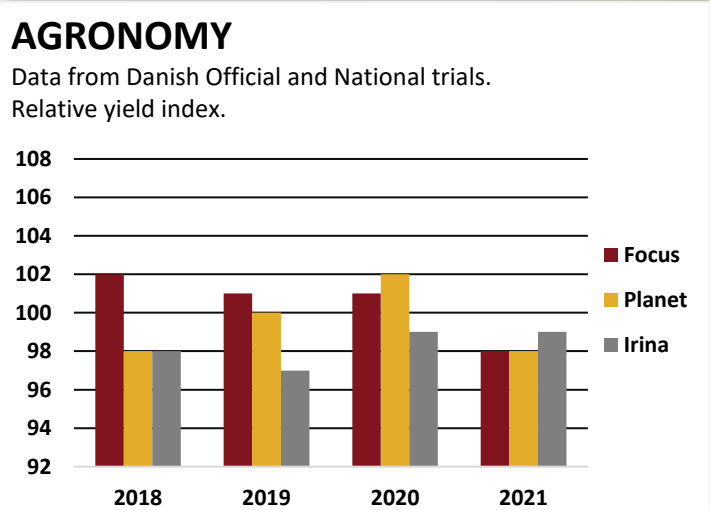
- ### INDUSTRY BREWING
- Brew house:**
- Good wort collection/lautering performance reported
 - Normal to good extract yield in the brewhouse
- Fermentation and filtration:**
- Normal / good fermentation and beer filtration reported
 - One result on experienced low fermentability was commented as "not malt related"
- Packaged beer:**
- As normal

VARIETY NAME: FOCUS



GENERAL INFORMATION

Variety: Focus
 Type: Two row spring malting barley
 Breeder: Secobra Recherches S.A., FR
 Representative: Nielsen & Smith, DK
 Distributer: Hornsyld
 Pedigree: Graze x Zeppelin
 Status: 525 ha multiplication in DK in 2021
 Geography: DK, FI, FR, CZ, GB, UA



Data from Danish National Trials 2018-2021	Irina/Planet	Focus
Relative yield %	99	101
Protein %	11,1	11,3
Grading >2,5mm %	97	97
Grading >2,8mm %	85	83
Specific weight (hl/kg)	68,3	70,3
Maturity	27-jul	26-jul
Straw length (cm)	67	69
Lodging (0-10, 0 is best)	0,1	1,3
Mildew (% coverage)	0	0,9
Barley rust (% coverage)	11,3	4,4
Skald (% coverage)	3,9	0,7
Net blotch (% coverage)	8,4	0,3

www.sortinfo.dk

VLB MICRO MALTING

Stress test crop 2018 at 41%, 43% and 45% steeping degree. Tested variety is compared to the two largest malting barley varieties in Denmark for crop 2018.

	KWS Irina_45	KWS Irina_43	KWS Irina_41	RGT Planet_45	RGT Planet_43	RGT Planet_41	Focus_45	Focus_43	Focus_41
Extract	4	4	4	4	4	4	2	2	2
Friability	4	4	5	3	4	5	2	3	3
Beta-Glucan	4	5	5	2	4	4	1	1	2
Viscosity	3	4	5	2	4	4	1	1	1
FAN, diff. *	3	5	8	-2	-3	1	3	0	-2
Soluble N, diff.*	20	25	45	5	5	30	40	15	5
Kolback, diff.*	1	1	2	-1	0	2	0	-1	-1
Alpha-Amylase	5	5	4	1	1	3	2	2	2
Beta-Amylase	1	1	1	2	1	2	5	5	5
Limit Dextrinase	0	0	0	0	0	0	0	0	0
Attenuation	2	4	3	2	4	4	5	5	5
Turbidity	1	1	1	4	4	5	2	1	1
Index **	19	23	22	19	25	27	20	19	19
Index mean ***	41			45			39		

Positive:

- Good extract level at all steeping degrees.
- Very good malt modification
- Low Turbidity/Haze values

Negative:

- Very low Beta Amylase Activity
- Noticeable low attenuation!

INDUSTRY MALTING

Comments to malted barley lots:

- Low levels of skinned grains in malted barley lots
- Good Germination Energy
- Good screening >2,8 mm

Malt results - Positive:

- Very high extract in all malted lots
- Well modified malt with low Beta-glucan levels

Malt results - Negative:

- Average/low Diastatic Power
- Low Beta Amylase activity as seen also for the stress test
- Low Attenuation seen in one of the trials

INDUSTRY BREWING

Brew house:

- Normal to good brewhouse yield

Fermentation and filtration:

- Significantly lower RDF generally seen!
- Normal beer filtration

Packaged beer:

- As normal

RECOMMENDATION

Focus is an average yielding malting barley variety with good agronomic features and good disease resistance. Malted barley lots of average quality. Focus produces an average malt with good malt modification and a high extract. Malt produced from Focus was found to have a significantly low Beta Amylase level and a noticeable low attenuation.

VARIETY NAME: PROSPECT

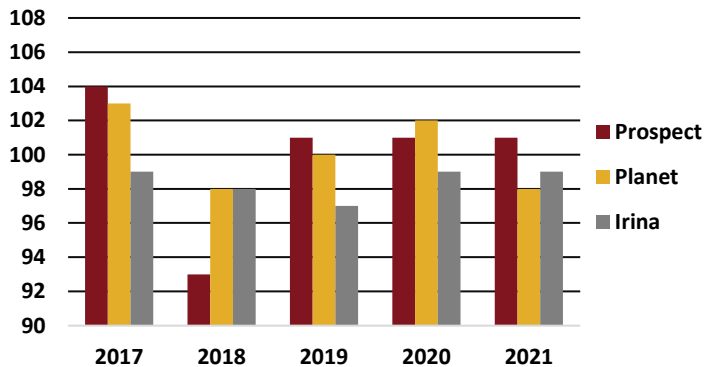


GENERAL INFORMATION

Variety: Prospect, Non GN variety
 Type: Two row spring malting barley
 Breeder: SEJET
 Representative: SEJET
 Distributer: DLG
 Pedigree: KWS Irina x Overture
 Status: 1.508 ha multiplication in DK in 2021
 Geography: DK, DE, SE, FI, FR, UA

AGRONOMY

Data from Danish Official and National trials.
 Relative yield index.



Data from Danish National Trials 2017-2021	Irina/Planet	Prospect
Relative yield %	99	100
Protein %	11	11
Grading >2,5mm %	97	97
Grading >2,8mm %	85	86
Specific weight (hl/kg)	68	69
Maturity	29-jul	29-jul
Straw length (cm)	65	67
Lodging (0-10, 1 is best)	0,5	0,5
Mildew (% coverage)	0	0
Barley rust (% coverage)	12,4	11,8
Skald (% coverage)	3,0	1,9
Net blotch (% coverage)	6,8	1,1

www.sortinfo.dk

VLB MICRO MALTING

Stress test crop 2017 at 41%, 43% and 45% steeping degree. Tested variety is compared to the two largest malting barley varieties in Denmark for crop 2017.

	KWS Irina_45	KWS Irina_43	KWS Irina_41	RGT Planet_45	RGT Planet_43	RGT Planet_41	Prospect_45	Prospect_43	Prospect_41
Extract	3	3	3	3	4	4	2	2	4
Friability	3	4	5	2	3	5	2	3	5
Beta-Glucan	2	4	5	2	3	5	2	3	4
Viscosity	2	3	5	1	2	4	2	2	3
FAN	2	2	3	2	2	3	3	2	3
Soluble N	2	2	3	2	2	3	2	2	2
Kolbach	2	3	3	2	2	3	2	2	2
Alpha-Amylase	4	4	4	1	2	3	2	2	3
Beta-Amylase	1	1	2	1	1	1	3	2	4
Limit Dextrinase	1	2	3	1	2	2	2	4	5
Attenuation	1	2	2	1	1	2	2	4	5
Turbidity	1	2	1	3	4	3	2	4	2

Positive:

- Average Extract level and Modification values

Negative:

- Low level of Beta Amylase and Limit Dextranase activity
- Low Attenuation level seen at low steeping degrees

INDUSTRY MALTING

Comments to malted barley lots:

- Impressively high Germination Energy in all malted barley lots
- No comments to visual appearance of barley
- Low to average level of skinned grains seen

Malt results - Positive:

- Good high extract levels in all malted lots
- Good malt Modification seen
- Very good Alpha-Amylase Activity
- Beta-Amylase on acceptable level and not low as seen in the stress test
- Nice low Haze in wort

Malt results - Negative:

- No significant negative values found for tested parameters

INDUSTRY BREWING

Brew house:

- Good lautering/wort collection
- Normal to very good brewhouse yield seen

Fermentation and filtration:

- Normal / good fermentation and beer filtration reported
- Final Attenuation normal to high

Packaged beer:

- As Normal

RECOMMENDATION

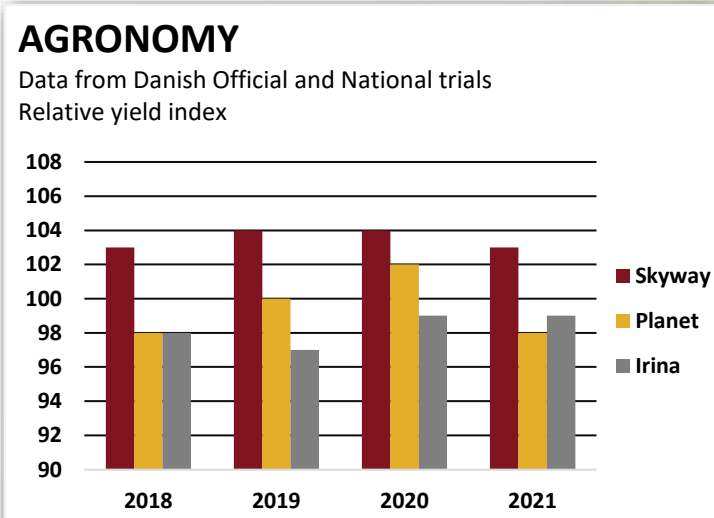
Prospect is an average yielding malting barley variety with good agronomic features and good disease resistance. All malted barley lots were of good quality especially in terms of Germination Energy. Beta Amylase and Final Attenuation were low in stress test. - However, this was not confirmed in full scale industry test.

VARIETY NAME: SKYWAY



GENERAL INFORMATION

Variety: Skyway
 Type: Two row spring malting barley
 Breeder: Nordic Seed
 Representative: Nordic Seed
 Distributer: DLA Agro/Danish Agro
 Pedigree: RGT Planet * NOS 2105-11
 Status: 1.938 ha multiplication in DK in 2022
 Geography: AT, DK, SE, FI, UK, UA, IR, Baltics



Data from Danish National Trials 2018-2021	Irina/Planet	Skyway
Relative yield %	99	104
Protein %	11,1	10,8
Grading >2,5mm %	97	98
Grading >2,8mm %	85	91
Specific weight (hl/kg)	68,3	69,7
Maturity	28/7	28/7
Straw length (cm)	65	67
Lodging (0-10, 1 is best)	0,5	0,5
Mildew (% coverage)	0	0
Barley rust (% coverage)	11,3	16,8
Skald (% coverage)	2,9	5,6
Net blotch (% coverage)	8,4	1,5

www.sortinfo.dk

VLB MICRO MALTING

Stress test crop 2019 at 41%, 43% and 45% steeping degree. Tested variety is compared to the two largest malting barley varieties in Denmark for crop 2019.

	KWS Irina_45	KWS Irina_43	KWS Irina_41	RGT Planet_45	RGT Planet_43	RGT Planet_41	Skyway_45	Skyway_43	Skyway_41
Extract	3	5	5	1	4	4	1	2	4
Friability	3	4	5	1	2	4	1	2	5
Beta-Glucan	2	4	5	1	2	4	1	3	5
Viscosity	2	3	4	1	1	4	1	3	5
FAN, diff.*	35	27	25	31	25	23	16	14	5
Soluble N, diff.*	33	31	40	24	23	22	-37	-21	-36
Kolback, diff.*	0	0	1	2	2	1	-3	-1	-3
Alpha-Amylase	4	4	5	1	1	2	3	2	4
Beta-Amylase	3	2	3	3	4	3	1	2	2
Limit Dextrinase	1	2	3	2	1	3	1	1	2
Attenuation	3	3	3	3	3	4	1	2	3
Turbidity	1	1	1	2	5	5	1	1	2
Index **	18	23	25	13	23	28	8	13	24
Index mean ***	42			38			26		

- Positive:**
- Good extract – with low level of skinned grains
 - Good levels of beta-amylase and limit dextrinase at all steeping degrees
 - Good final attenuation at all steeping degrees
- Negative:**
- Somewhat low level of alpha-amylase
 - Low proteolytic activity observed

RECOMMENDATION

Skyway is a high yielding malting barley variety with good grading and average agronomic features. Skyway had high extract in all malted lots and a good modification. Skyway is slightly low in alpha-amylase activity. Final attenuation was found to be on the lower side, however end-fermentation in final full-scale product was normal to good. Malting plants need to be aware of low proteolytic activity when malting Skyway.

- ### INDUSTRY MALTING
- Comments to malted barley lots:**
- All lots reported to be healthy and good looking
 - Good germination energy
- Malt results - Positive:**
- Average to high extract levels in all malted lots
 - Nice low haze in wort
 - Good modification
- Malt results - Negative:**
- Low alpha-amylase activity
 - Average to low final attenuation found on lab fermentation
 - Slightly low proteolytic activity

- ### INDUSTRY BREWING
- Brew house:**
- Normal to good brewhouse yield seen
- Fermentation and filtration:**
- Good / very good fermentation time and beer filtration reported
 - End-fermentation reported to be normal to good
- Packaged beer:**
- As Normal