

VIKING MALT



WHEAT MALT IN
BREWING

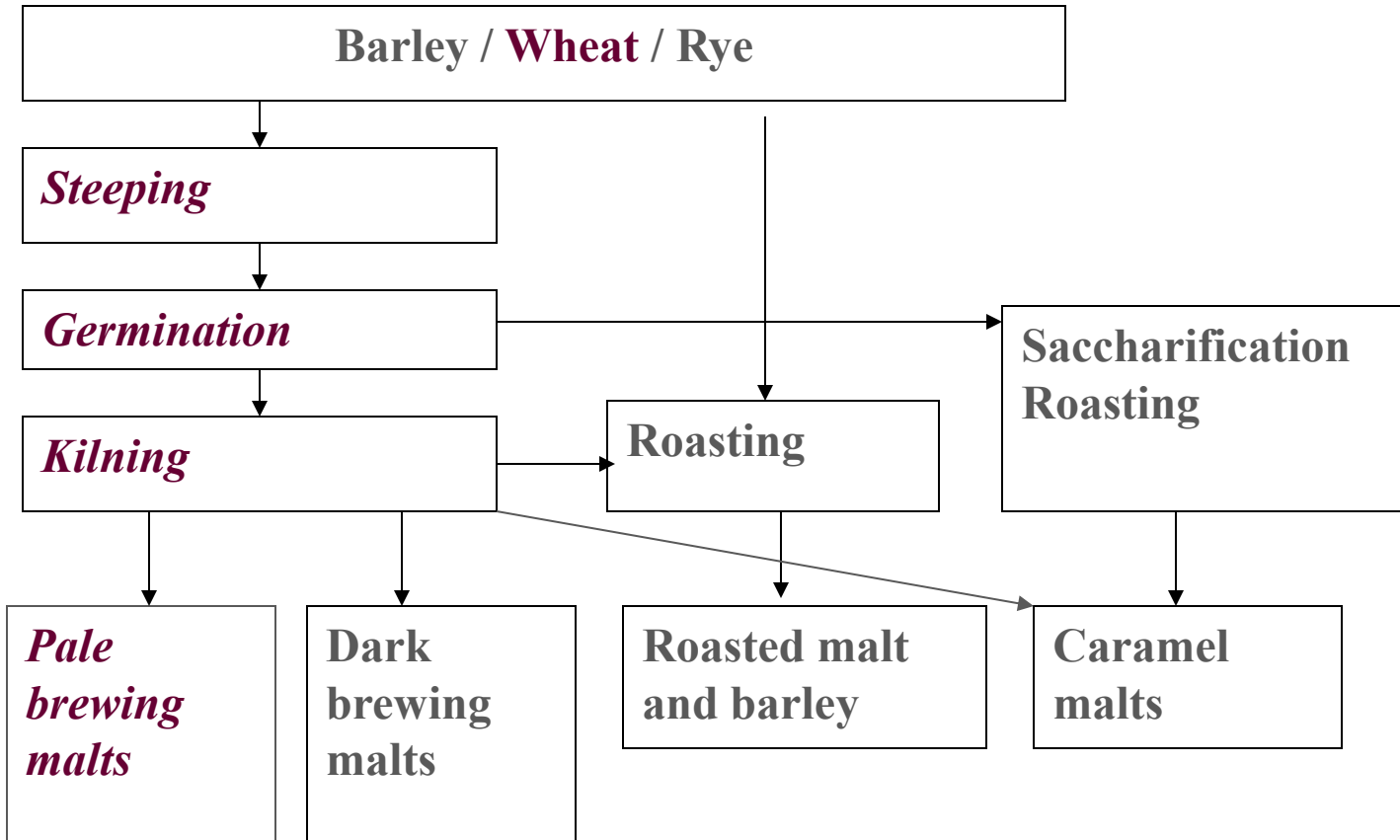
Viking malt malt types

- pale brewing malts
- dark brewing malts
- pale caramel malts
- dark caramel malts
- roasted products
- other malts like wheat malt

Wheat as a raw material

- wheat has no husk
- requirements for malting wheat are same as for barley
- two kinds of wheat available
 - A- type used mainly for baking
 - B- type used mainly for feed
 - brewing varieties do not exist at the moment
- malting process does not differ much from pilsner malt production
 - faster water uptake in steep
 - germination in cool conditions
 - final kilning temperature 80 – 85 °C

Production of wheat malt



Wheat vs barley

	Barley	Wheat	Unit
Protein	11	12	% dm
Fat	3	3	% dm
Minerals	2,9	1,8	% dm
Starch	63	64	% dm
Beta-glucans	3,5	0,3	% dm
Pentosans	9	8,5	% dm

Source: EBC Manual of Good Practice, Malting Technology

Wheat wort

- Example of high gravity wort results:

Analysis	unit	100 % PM	20 % Wheat malt	40 % Wheat malt
Extract	m-%	16,19	16,29	16,23
Yield	% / dm.	81,7	83,6	84,6
Soluble N	mg / 100 g	815	836	853
pH		5,6	5,6	5,7
Colour	°EBC	7,5	8,0	9,0
Haze	F.U. EBC	5,2	8,5	10,8
β-glucans	mg / l	150	116	105
FAN	mg / l	334	302	258
App. degree of ferm.	%	85,9	84,6	83,8
Büchner-filtrate 15 min	g	94,9	89,1	82,1
Saccharification	min / °C	5/72	5/72	5/72

Wheat wort

- Example of high gravity wort sugar compositions:

	fructose (% dm)	glucose (% dm)	maltose (% dm)	maltotriose (% dm)	fermentable sugars (% dm)
Pilsner malt	1.8	8.8	47.2	10.6	68.4
25 % wheat malt wort	1.5	8.5	46.9	10.4	67.3
50 % wheat malt wort	1.5	7.8	45.7	9.9	64.9

Wheat lager trial beer

- 11 °Plato lager beer with 30 % wheat malt was brewed
 - reference beer 100 % pilsner malt
 - brewsize 100 liters in pilot brewery
 - main fermentation and maturation at 12 °C
 - bottom yeast was used
- purpose of the trial was to look for the positive effects of the wheat malt in the brewing process and beer quality

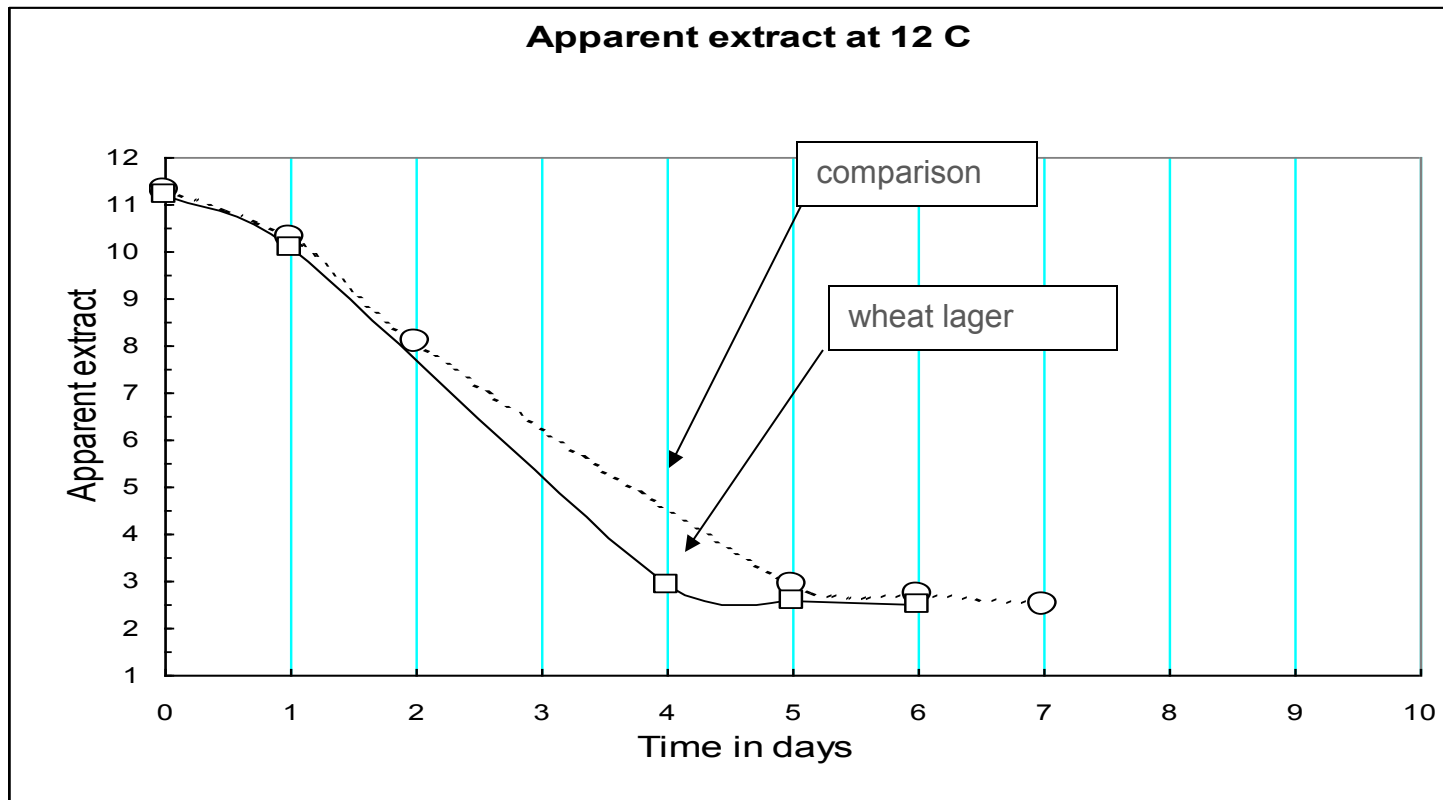
Brewhouse performance

- both brews saccharified normally
- worts were separated using Meura mash filter
 - both worts performed well
 - no difference between worts
- wort results:

	Unit	Reference	Wheat Lager
Extract	p- %	11.3	11.2
Colour	EBC	9.3	8.8
FAN	mg / l	272	226
pH		5.2	5.3
Bitterness	BU	38	40
Yield	%	74.5	74.4
Meura index	kPa x min	1240	1340

Main fermentation

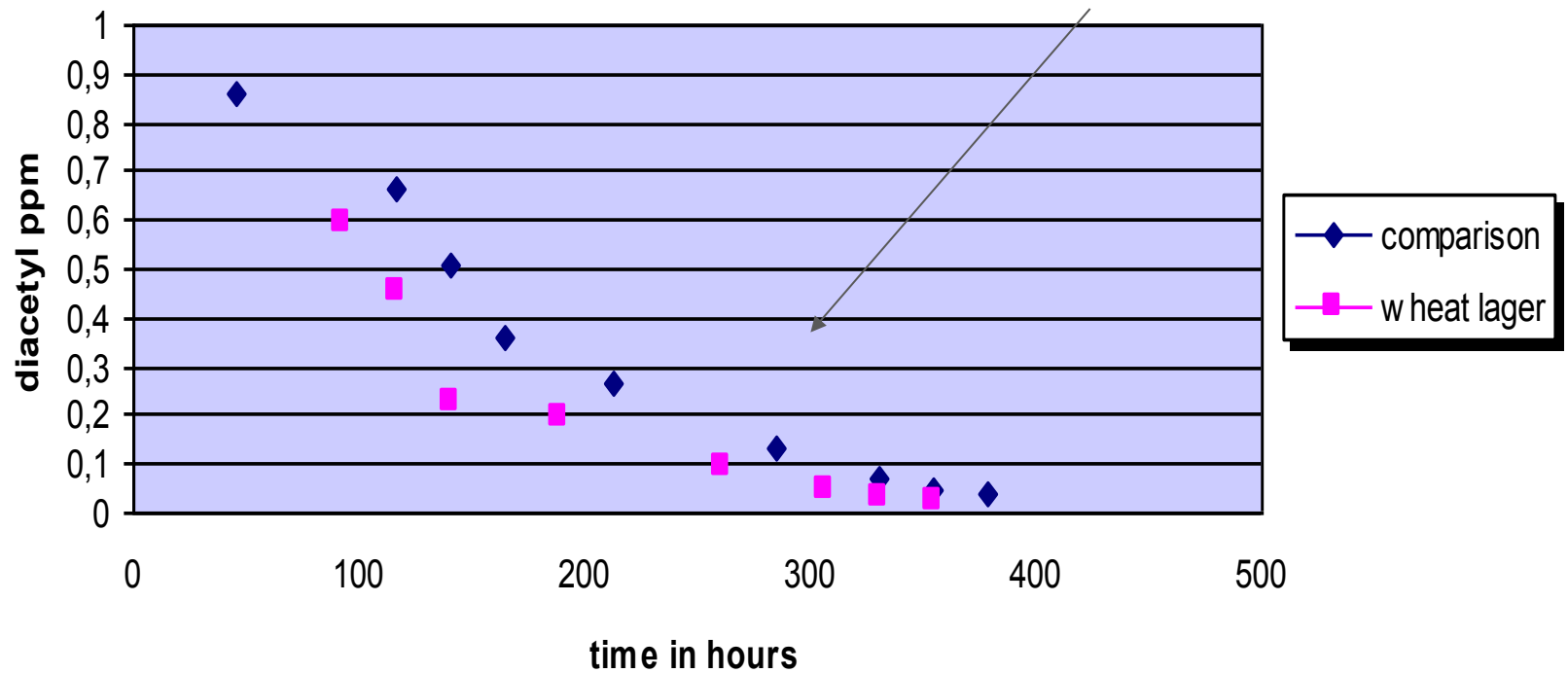
- main fermentation was completed in 6 days for Wheat Lager (comparison 7 days)



Maturation

hours	comparison ppm	wheat lager ppm
306		0,05
330	0,073	0,034
354	0,044	0,026
378	0,037	

Diacetyl in fermentation



Beer filtration

- both beers were filtrated separately using Seitz EK sheets and 0.45 μm membranes
 - comparison:
 - 2 bar pressure for 40 minutes resulted 40 kg beer
 - wheat lager:
 - 2 bars for 30 minutes + 3.5 bars for 60 minutes resulted 33 kg beer
- ⇒ wheat lager showed poorer filterability

Beer analysis

Analysis	unit	Comparison	Wheat lager 30%
Original gravity	mas. %	11,1	11,0
Alcohol	vol. %	4,78	4,75
Residual extract, app.	p- %	2,06	2,04
Apparent degree of ferm.	%	81,4	81,5
Bitterness	EBU	20	19
Colour	EBC	6,9	6,5
pH		4,49	4,39

Beer stability

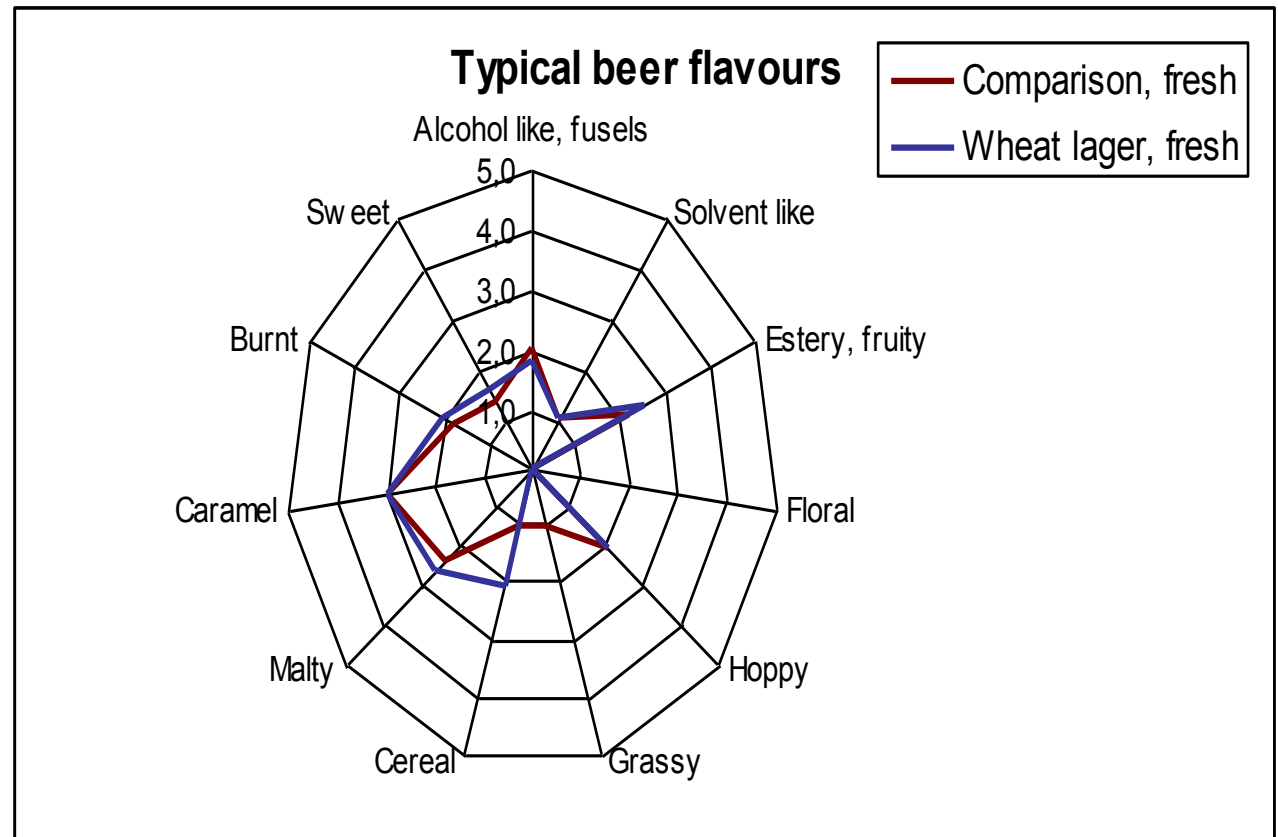
Analysis	unit	Comparison	Wheat lager 30%
Foam stability	s	256	242
Initial haze	FU	0,3	0,3
Haze after 7 d 40 C	FU	0,5	0,4
Polyphenols	mg/l	196	138
PT-st,P40	ml/100 ml	26,2	16,5
PT-st,T125	ml/100 ml	10,5	32,6

Aroma analysis

Analysis	unit	Comparison	Wheat lager 30%
Ethylacetate	mg/l	19,6	19,7
3MeBu-aset	mg/l	0,9	1,2
Propanol	mg/l	15,2	14,8
2Meprop-OH	mg/l	9,3	10,0
3MeBut-OH	mg/l	40,0	51,7
2MeBut-OH	mg/l	12,7	13,9
Asetaldehyde	mg/l	1,2	1,0
Taste		3,8	3,8
Taste after 1 week +40°C		2,2	2,6

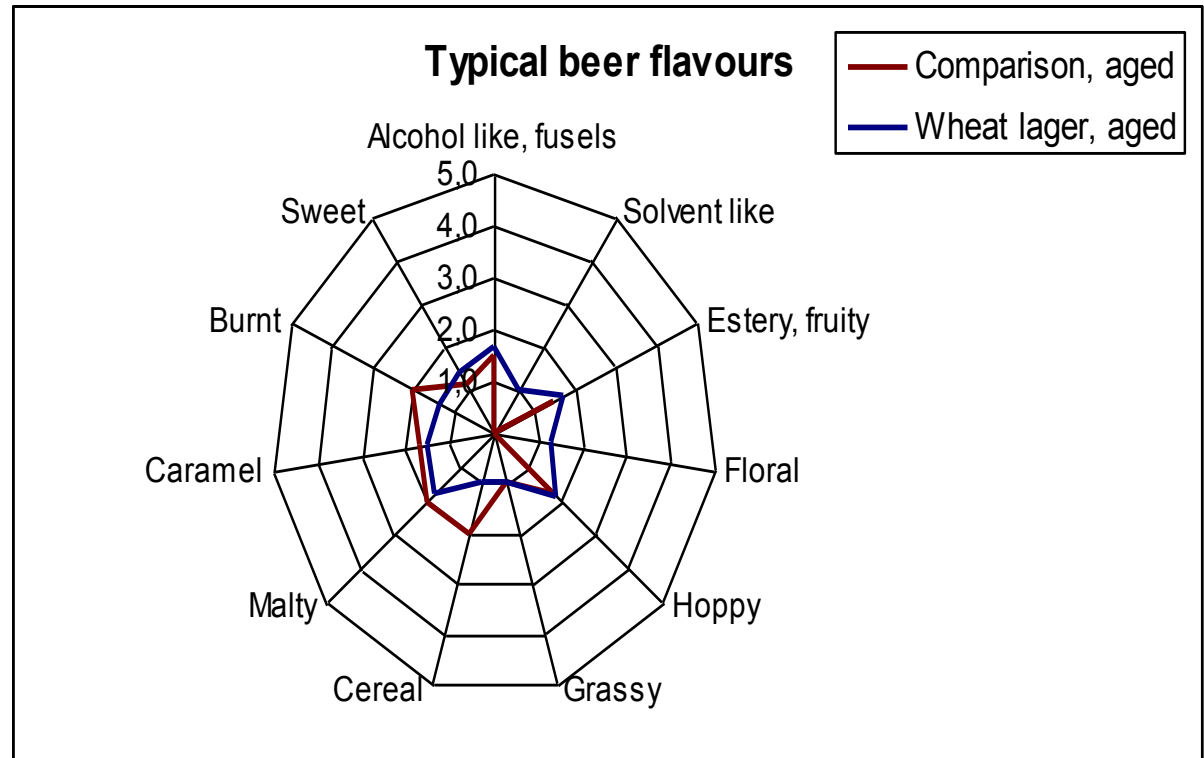
Flavour profile 1

- six trained tasters
- scale 1 - 5
- fresh beer flavours were almost similar



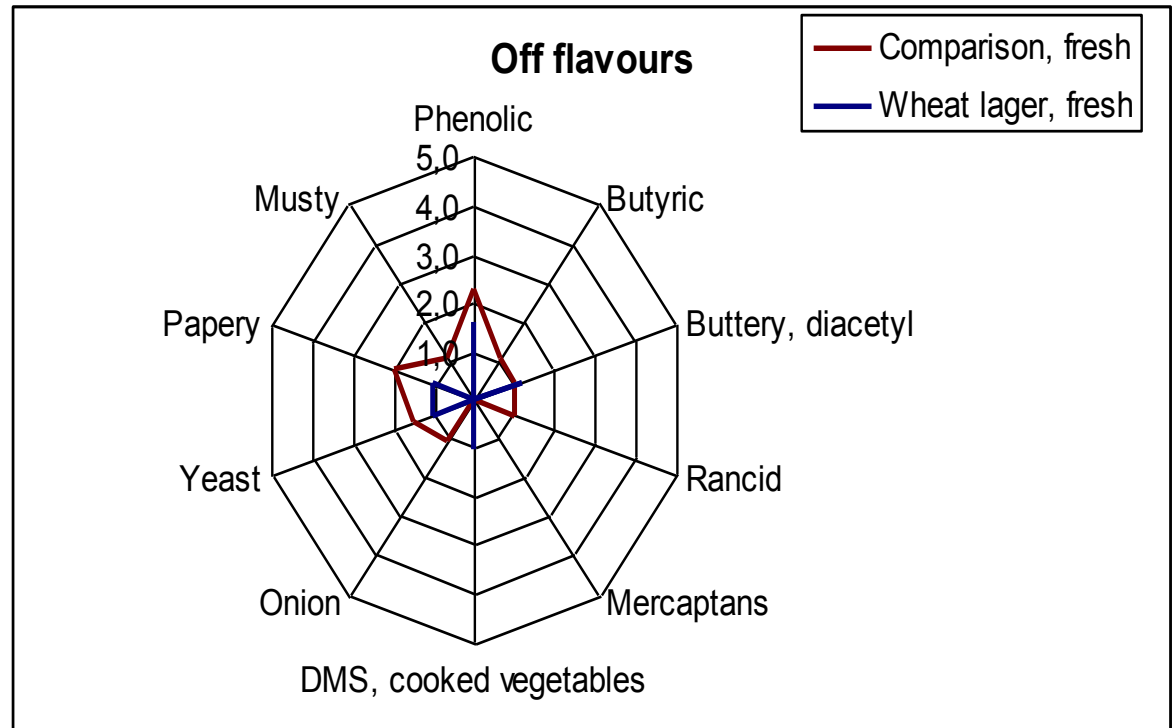
Flavour profile 2

- six trained tasters
- scale 1 - 5
- aged beers were subtle in flavour
- comparison showed more cereal and burnt notes whereas wheat lager was more floral and solvent like



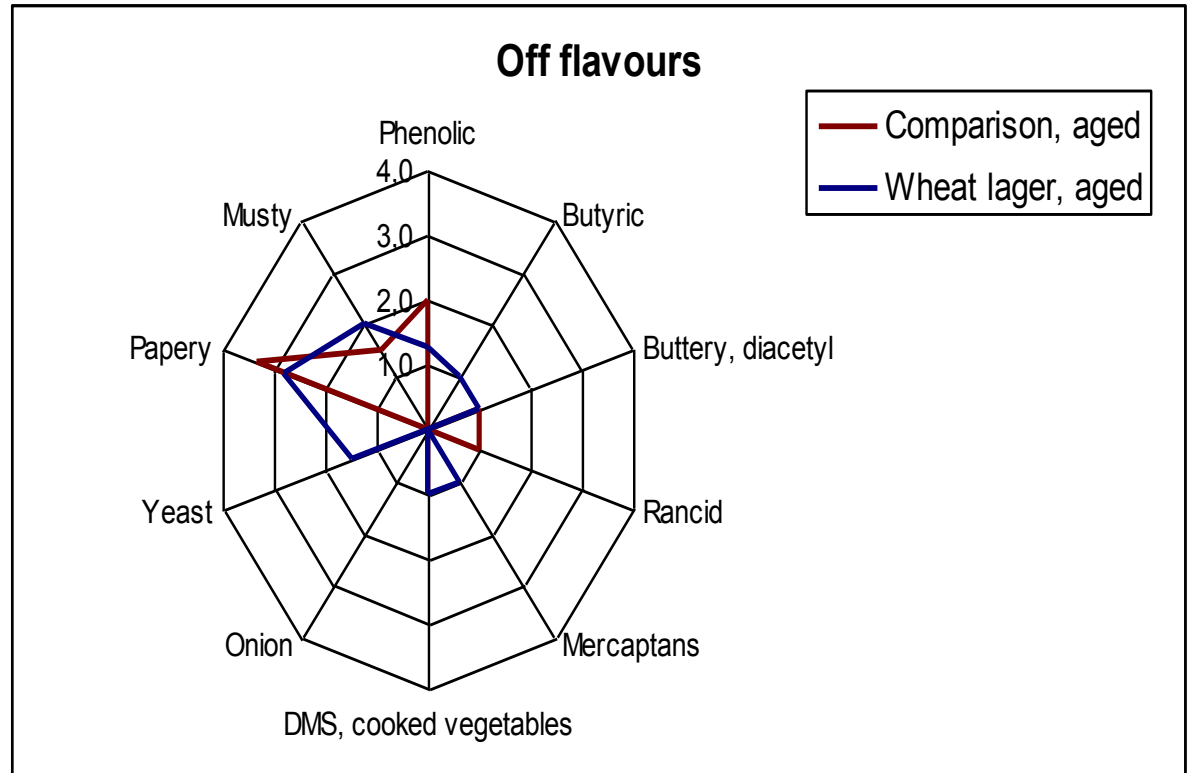
Flavour profile 3

- six trained tasters
- scale 1 - 5
- comparison gave more off flavours than wheat lager



Flavour profile 4

- six trained tasters
- scale 1 – 5
- effect of ageing was rather similar on both beers



Wheat lager summary

- use of wheat malt shortened the production times compared to pilsner malt
 - faster main fermentation
 - lower diacetyl formation
- usage of wheat malt impaired filterability
- wheat malt seems to slightly enhance ester formation, specially amyl esters
- use of wheat malt improved flavour stability in this trial