Production of hop xanthohumol- and isoxanthohumol-enriched beers

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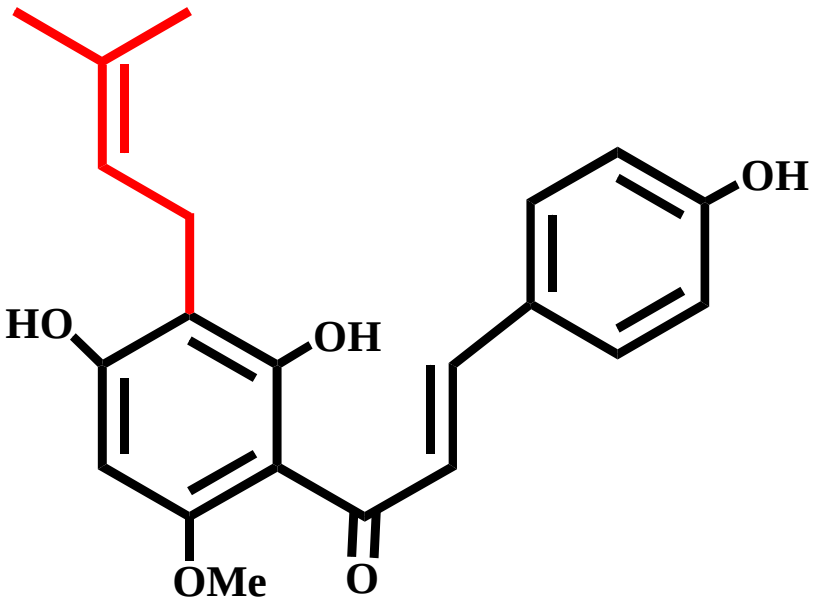
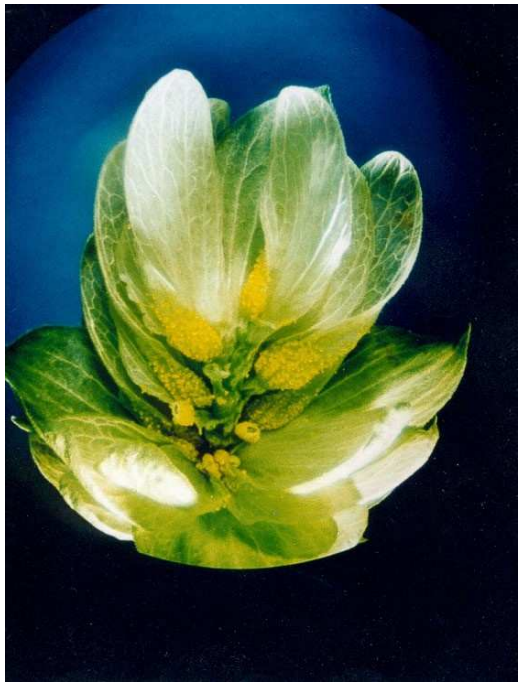
Hopsteiner, Mainburg

Production of hop xanthohumol- and isoxanthohumol-enriched beers

- ✓ Health benefits of XN and IX
- ✓ XN and IX in beer

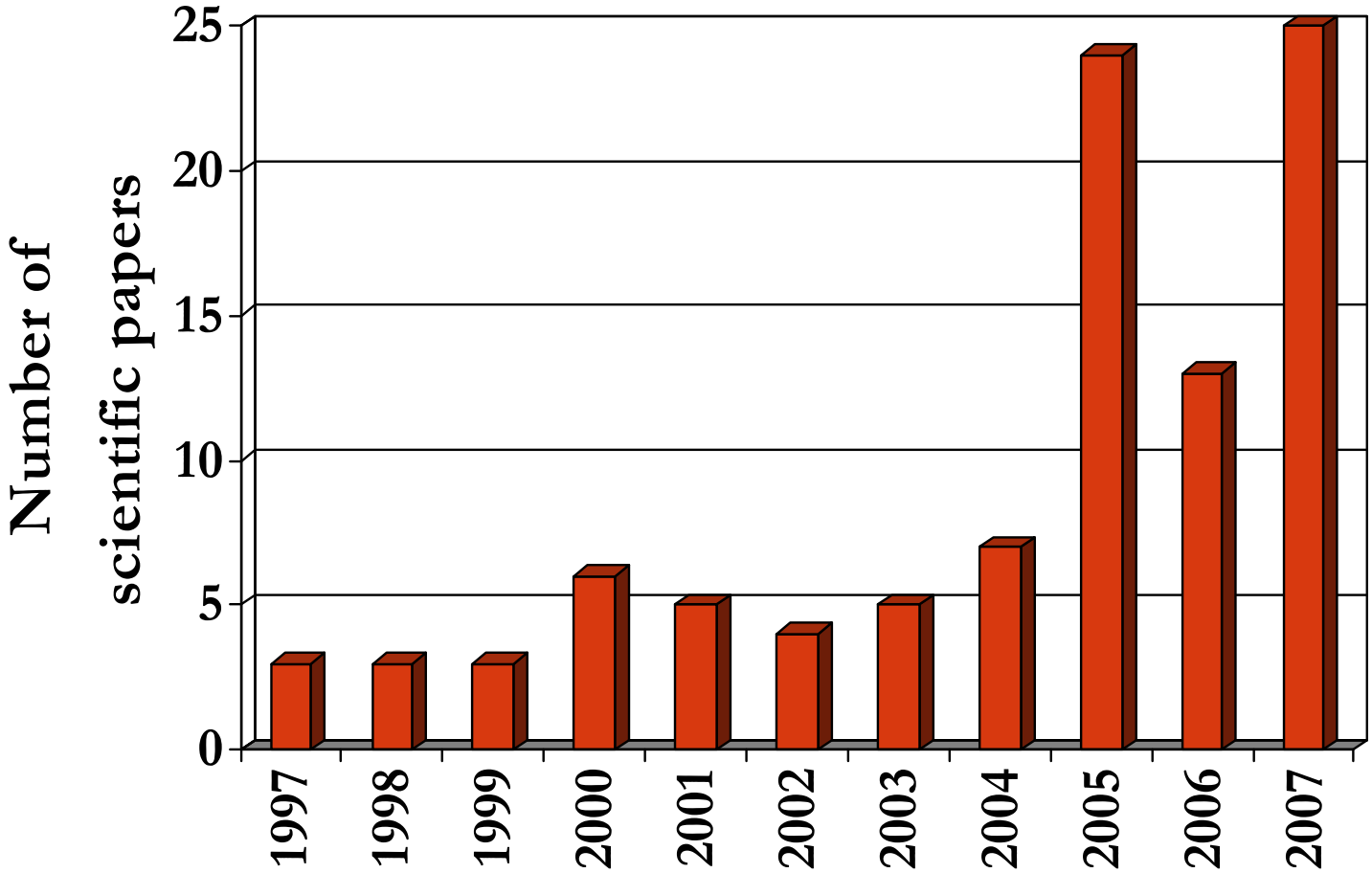


Xanthohumol (XN)
Prenylated flavonoid

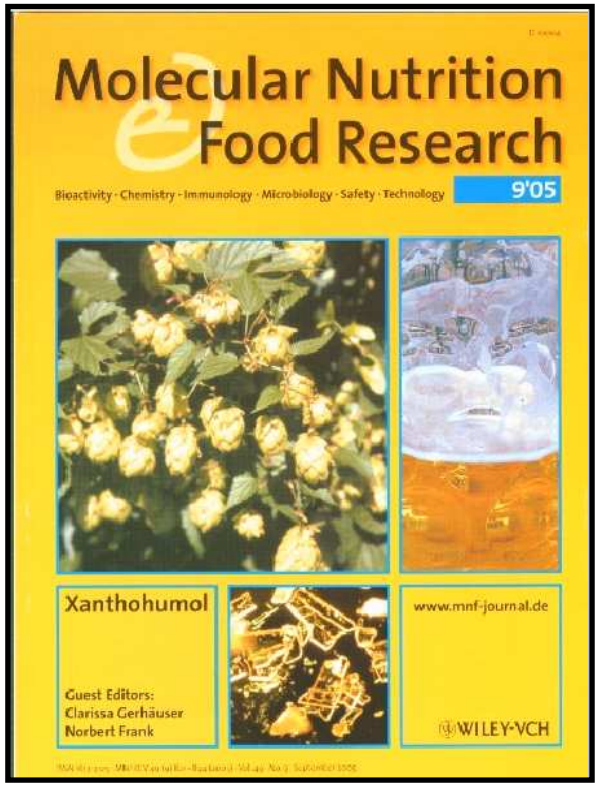


Component of the
hard resin fraction

Research on the health benefits of XN



“Molecular Nutrition and Food Research“



- ✓ September`05: Special “Xanthohumol“ issue
- ✓ Editorial: “Xanthohumol - a new all-rounder?“

"Xanthohumol – a new all-rounder?"

Results mainly from "in vitro" experiments (test tubes)

- antibacterial
- against malaria
- anti-inflammatory
- against arteriosclerosis
- antiviral
- antioxidant
- against diabetes
- cancer preventive

Animal trials: high dosages are well tolerated

Active dosages are still unknown

Fate of XN from field to beer

- ✓ In cones: 0.2 - 1 % XN
- ✓ Content dependent on:
  - variety
  - growing area
  - crop year

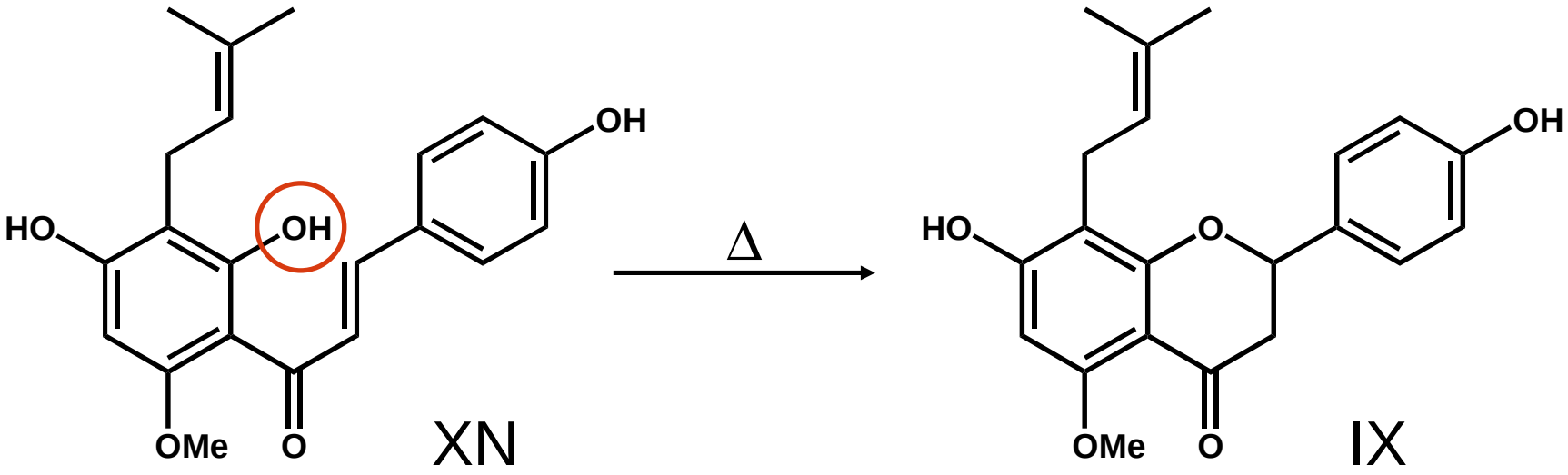
Biendl, 2002

Recovery of XN in commercial hop products

- ✓ Pellets: 95 %
- ✓ Ethanol-extract: 95 %
- ✓ CO_2-extract: < 5 %
- ✓ Downstream products: 0 %

Biendl et al., WBC 2000

Isomerisation during wort boiling



++	cancer prevention	+
++	antioxidant activity	+

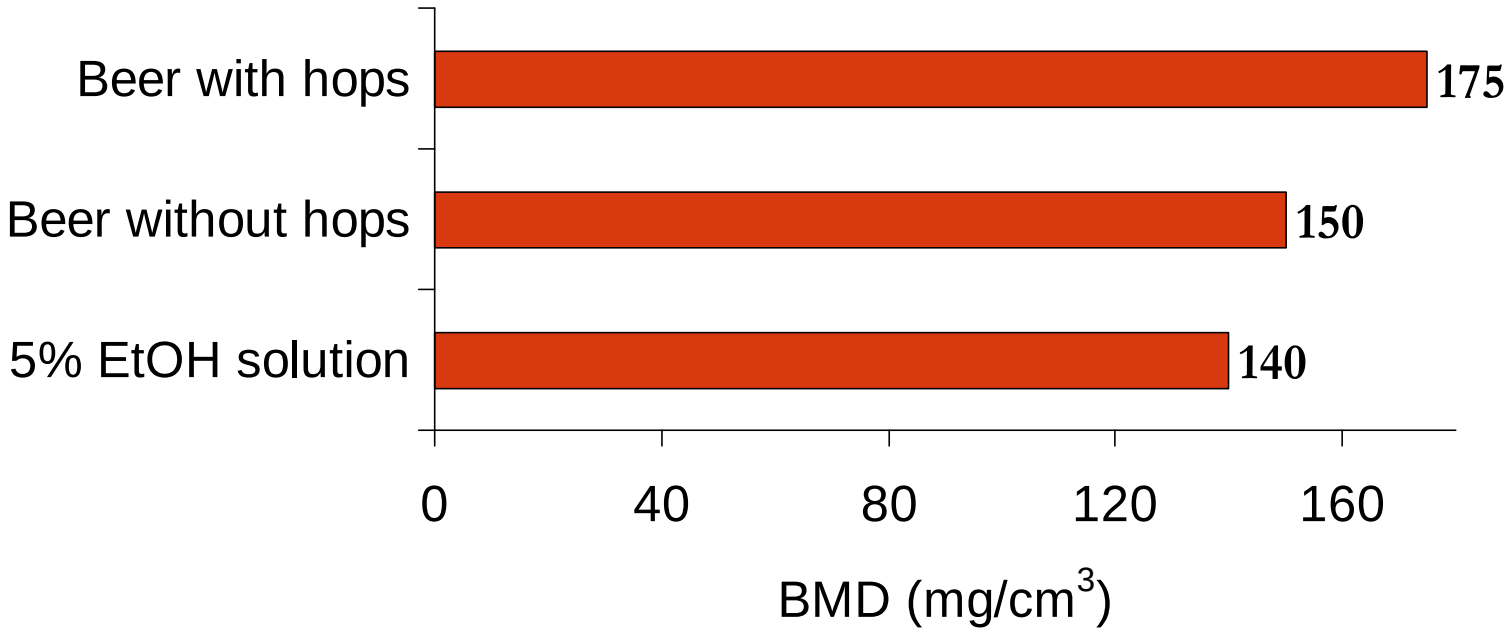
Stevens and Page, 2004

Osteoporosis

- ✓ Osteoporosis is a well-known condition in women following menopause
- ✓ It is characterized by reduced bone mass and deterioration of bone tissue leading to bone fragility with the consequence of fracture
- ✓ Some studies indicate that moderate alcohol intake is associated with higher bone mineral density in postmenopausal women

Beer and osteoporosis

Effect on bone mineral density (BMD) in female rats:



❖ Active ingredient in beer: IX

Kondo, 2004

XN and IX contents in commercial beers

	Lager / Pilsner	Stout / Porter
XN (mg/l)	< 0.2	< 1.2
IX (mg/l)	< 2.1	< 2.5

Influence of roasted malt on content of XN in beer

Piendl and Biendl, 2000 / Walker et al., 2004

Verification of high XN content in Stouts

1hl scale (BRi), standard technology, fine filter (XE200)

Ethanol-extract	Dosage		Filtered beer		
Variety: Spalter Select	alpha mg/l	XN mg/l	XN mg/l	IX mg/l	EBC-BU
Addition at begin of wort boiling	120	12	1.2	2.5	32

Biendl, WBC 2004

Beers rich in XN

✓ Stout / Porter

- conventional technology
- use of ethanol-extract or pellets

✓ “XAN Technology“

- technology developed at brewing faculty of TU Munich-Weihenstephan (Prof. Back)

Losses of XN during beer production

- ✓ Wort boiling
- ✓ Fermentation
- ✓ Stabilization
- ✓ Filtration

❖ Reduced losses with “XAN Technology“

Stevens et al., 1999

"XAN Technology"

- ✓ Kettle: hop addition 5 minutes before end of boiling, rapid cooling down to 80℃ by addition of cold wate r
- ✓ Fermentation: recovery of yeast
- ✓ Stabilization: no PVPP
- ✓ Filtration: gentle (or centrifugation)

Wunderlich et al., 2005

Beers based on “XAN Technology“

“XAN“ of “Weihenstephan“ brewery (launched 2004)

"XAN" wheat beer

- ✓ Gravity: 12.9 w. %
- ✓ Alcohol: 5.8 vol. %
- ✓ Colour: 18 EBC units
- ✓ Bitterness: 23 EBC BU
- ✓ Xanthohumol: 1 mg/l

❖ Use of a xanthohumol-enriched hop product

Production of XN enriched hop products

Pilot plant

Xantho-Flav™

10 % - 95 % XN

- ✓ “Xantho-Flav Extract“: 10 % XN
- ✓ “Xantho-Flav Pure“: > 85 % XN

“Xantho-Flav Extract“ - pale malt

Dosage at start of wort boiling: 1kg/20hl → 50mg XN/l

Resulting beer (Pilsner, 20 hl, filtered with kieselguhr):

EBC BU	mg/l XN	mg/l IX
31	< 0.1	8.1

“Bitterness is more harmonic as compared to a control beer produced with extract and pellets“

Stettner et al., EBC Congress 2003

“Xantho-Flav Extract“ - roasted malt

Standard brew	Stout /38 BU	Porter /38 BU
Scale	1 hl	40 hl
Filtration	fine filter sheet	kieselguhr
XN-dosage	54 mg/l	45 mg/l
IX in beer	9.0 mg/l	11 mg/l
XN in beer	3.3 mg/l	2.7 mg/l

Biendl, WBC 2004

Market situation (April 2008)

✓ Beers with emphasis on IX

- no product on the market

✓ Beers with emphasis on XN

- “ZATEC Xantho“
- “Weihenstephaner XAN Wellness“

“ZATEC Xantho“

- ✓ Dark beer
- ✓ Gravity: 14 w. %
- ✓ Alcohol: 5.7 v. %
- ✓ Bitterness: 18 EBC BU
- ✓ Xanthohumol: 0.3 mg/l
- ✓ Isoxanthohumol: 3 mg/l

Claims on the label of “ZATEC Xantho“

- ✓ *“By selection of raw materials and a special brewing technology it has been possible to almost double the content of an especially demanded ingredient, called xanthohumol“*

- ✓ *“Taste this black diamond under the beers and experience its enchanting effect contained in it“*

“Weihenstephaner XAN Wellness“

Beermix consisting of

✓ 40 % wheat beer

- alcohol-free

✓ 60 % multi-fruit beverage

- acerola, apple and lemon juices

“Health“ ingredients of “XAN Wellness“

- ✓ Declarations on the label:
  - vitamin C (9.0 mg/ 100 ml)
  - folic acid (0.03 mg/100 ml)
  - XN-rich hop extract (0.0005 %)
- ✓ Xanthohumol: 3 mg/l
  - use of a food grade emulsifier

“Health“ claims on “XAN Wellness“

- ✓ *“Revises the health and does your body and soul good“*
- ✓ *“Naturally rich in xanthohumol“*
- ✓ *“Xanthohumol can render free radicals harmless because of its antioxidant activity and it can help to keep the cells in your body healthy“*

Summary

Technologies to enrich XN or IX have been developed

First XN-enriched beers are introduced to the market