Production and properties of oat fermented food in China

Li Zaigui
China Agricultural University
lizgcau@163.com

contents

- **Instruction**
- **The productions of fermented oats foods**
- **The health properties of fermented oats foods**
- **Conclusion**

Instruction

- **Oats have high starch, protein, lipid**
- **Oats have hard outer layer**
- **Oats have the possibility to ferment through special attention is needed**
- **Oats have being widely used for producing of fermented foods in China.**

Kinds of fermented oats foods

- **Alcohol (Baijiu)**
- **rice wine (Huangjiu)**
- **vinegar**
- **beverage**
- **bread, biscuit**

Alcohol

Yunnan

Heilongjiang

Hongkong

Baicheng

Qinghai

Maker: over 20

Prodution: 20 Thousands ton

History: 5 years!

Oats rice wine

Zhejiang

Production: 1000 tons

History: 4 years

Oat biscuit

Maker:over 20

The percent of oats?

Beverage

Maker:over 10
Fermented oat beverage:2

High fiber : Cellulase, Hemicellulase
High protein: Protease
Starch: Amylase

The addition and the conditions are still secret!

Oats vinegar

Shanxi

Maker: 4

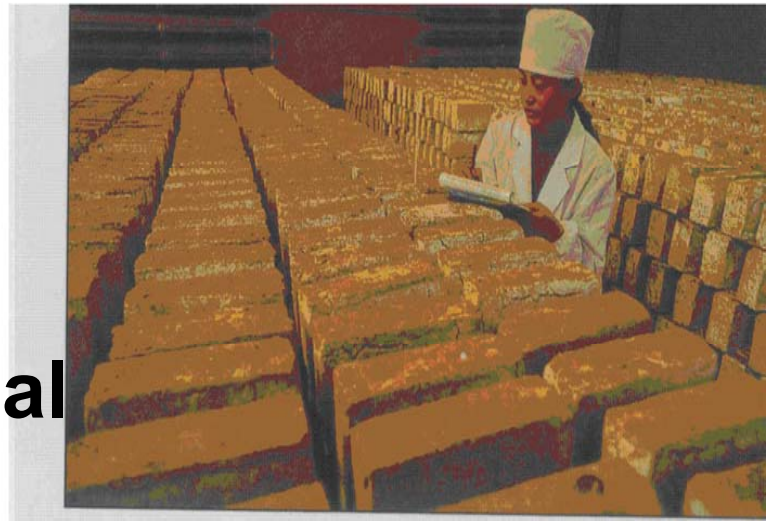
Production: about 3000 tons

History: 3000 years

Oat is the main material of oats vinegar

But many of Shanxi aged vinegar are made of sorghum using koji ,

oats are a main composition of koji

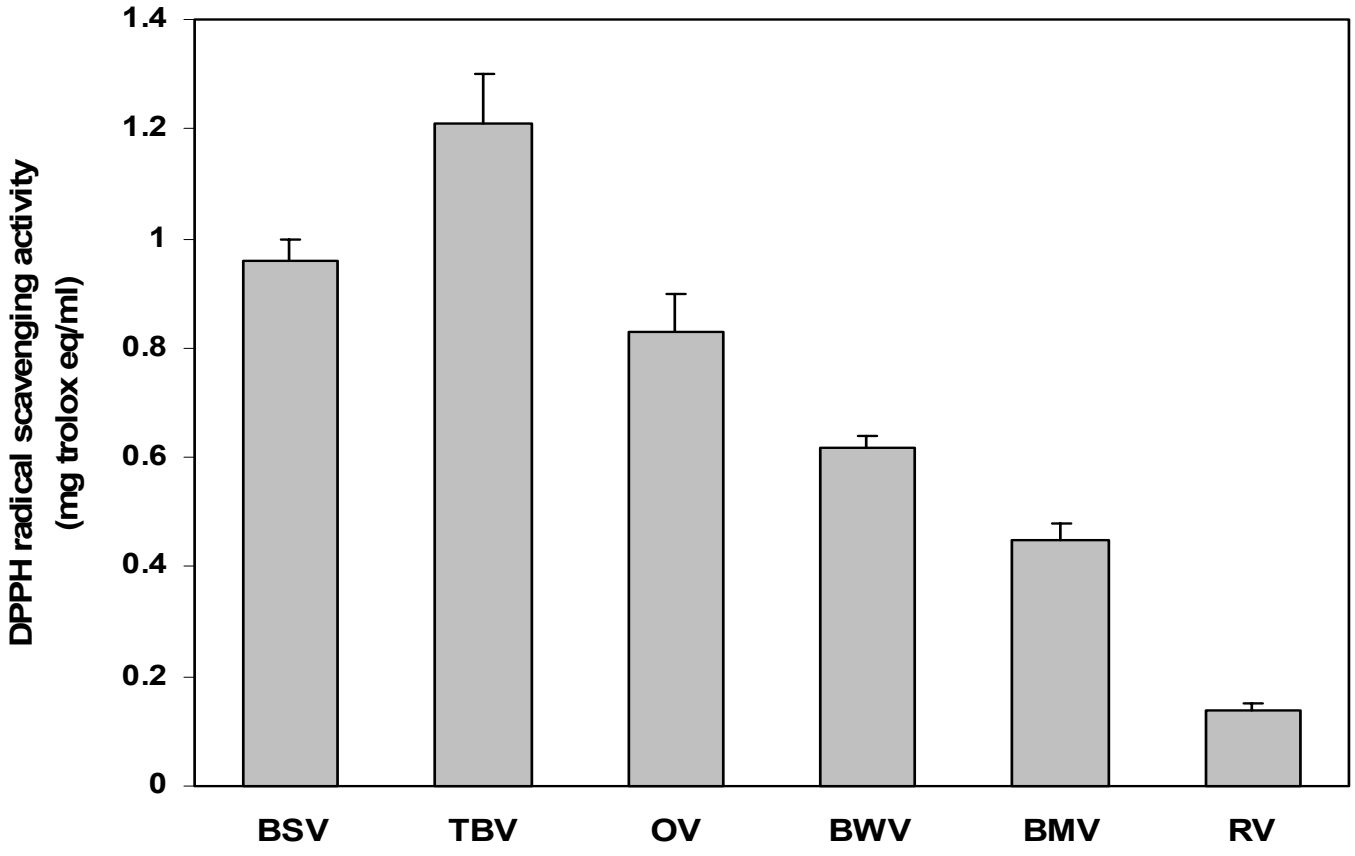


60% oats, 40% peas

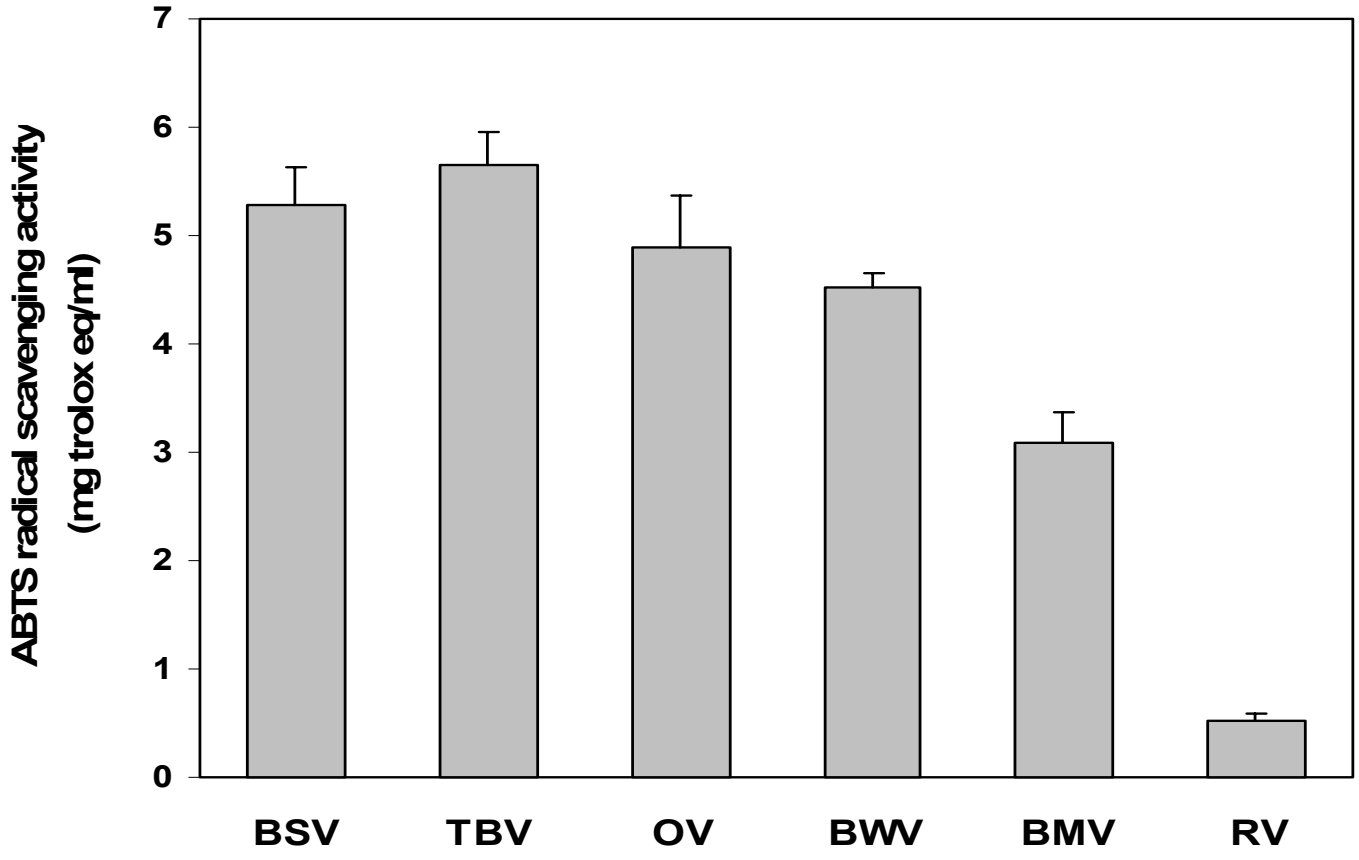
Koji is 60% of raw material

Production of aged oat vinegar

Raw material: oat
Koji: okuma
alcohol fermentation: longer 15-20 days
Acid fermentation: higher temperature 45℃
Special processing: roasting
Ageing time: very long 6 months-10 years



DPPH radical scavenging activity



ABTS radical scavenging activity

MDA, SOD and GSH-PX activities in blood serum of mice

group	n	MDA(nmol/mL)	SOD(U/mL)	GSH-PX(U/mL)
control	10	5.073±0.553[ab]	212.809±19.968[a]	872.181±82.139[a]
Aged group	10	5.976±0.379[a]	174.946±37.916[b]	734.830±87.633[b]
V_E control	10	5.104±0.532[ab]	214.623±24.823[a]	943.350±95.464[a]
Oat vinegar (low)	10	4.834±0.361[b]	229.305±19.960a	863.701±83.796[a]
Oat vinegar (medium)	10	4.704±0.412[b]	236.490±25.670[a]	875.349±84.440[a]
Oat vinegar (high)	8	4.953±0.322[b]	176.710±29.541[b]	853.825±80.232[a]

Vitamins, total phenolics, alkaloids and saponin in vinegar

	BSV	OV	TBV	ZHV	LRV
Nicotinic acid (mg/100 g)	29.24 ± 2.63	**37.83 ± 1.48**	34.12 ± 1.53	11.91 ± 0.15	2.33 ± 0.03
Nicotinamide (mg/100 g)	24.48 ± 1.24	**35.03 ± 2.74**	13.37 ± 0.30	13.52 ± 1.28	1.23 ± 0.05
Thiamine (μ g/100g)	0.37 ± 0.09	**0.71 ± 0.06**	0.46 ± 0.07	0.13 ± 0.01	—
Riboflavin (mg/100 g)	1.45 ± 0.05	**1.63 ± 0.34**	0.89 ± 0.04	2.1 ± 0.05	—
Phenolics (μ g/mL)	3964.7 ± 64.2	**2812.1 ± 52.8**	4518.1 ± 107.5	1564.2 ± 103.7	382.4 ± 20.7
Alkaloids (mg/mL)	0.82 ± 0.07	**1.21 ± 0.26**	0.65 ± 0.05	0.98 ± 0.14	0.09± 0.01
Saponin (mg/mL)	0.59± 0.06	**0.66 ± 0.02**	0.60 ± 0.05	0.29± 0.03	0.183± 0.03

Organic acid contents in different vinegar

	BSV	OV	TBV	ZHV	RV
Tartaric acid	1.54 ± 0.16	7.32 ± 1.15	3.45 ± 0.21	1.92 ± 1.11	3.04 ± 0.09
Formic acid	1.80 ± 0.21	4.51 ± 0.88	2.90 ± 0.14	0.3 ± 0.21	0.27 ± 0.16
Malic acid	4.50 ± 0	8.57 ± 0.45	6.50 ± 0.71	1.92 ± 1.01	1.09 ± 0.06
Lactic acid	25.50 ± 4.24	54.38 ± 0.88	22.50 ± 2.12	9.38 ± 3.71	33.04 ± 11.67
Acetic acid	57.05 ± 1.06	98.13 ± 2.65	73.5 ± 7.78	59.25 ± 26.52	62.63 ± 6.89
Citric acid	0.33 ± 0.08	1.05 ± 0.06	1.25 ± 0.21	1.43 ± 0.74	2.29 ± 0.16
Succinic acid	0.41 ± 0.14	0.63 ± 0.25	0.23 ± 0.02	0.69 ± 0.30	0.67 ± 0.11
total	**91.1**	**175.95**	**111.43**	**75.32**	**103.39**

Minerals contents of different vinegar

	BSV	OV	TBV	ZHV	LRV
Calcium	651.3 ± 49.4	1246.3± 71.8	695.9 ± 70.8	133.8 ± 11.4	31.7± 6.1
Phosphorus	3334.5 ± 124.7	4722.5 ± 390.5	3465.6± 221.6	1968.0 ± 77.3	22.2 ± 2.6
Iron	161.9 ± 22.3	304.6 ± 28.6	139.6± 18.4	38.2 ± 4.7	1.4 ± 0.0
Zinc	22.2 ± 1.3	37.8± 1.9	17.7 ± 2.1	16.5 ± 1.4	0.2 ± 0.0
Manganese	45.1 ± 3.2	70.3 ± 5.6	39.7± 4.7	45.3 ± 4.4	0.0± 0.0
Iodine	0.1± 0.0	0.5± 0.1	0.1 ± 0.0	0.3± 0.0	0.0 ± 0.0

Effect of oat rice wine on mice serum MDA, SOD and GSH-PX activities

GROUPS	MDA（n mol ml^{-1}）	SOD(U ml^{-1})	GSH-PX(U ml^{-1})
oat rice wine(low)	12.16 ± 1.27^{bc}	184.28 ± 23.88^{ab}	258.19 ± 11.2^{bc}
oat rice wine(medium)	14.11 ± 2.39^{b}	195.82 ± 15.39^{ab}	272.46 ± 24.5^{ab}
oat rice wine(high)	13.64 ± 3.01^{b}	189.305 ± 9.26^{ab}	275.1 ± 12.43^{ab}
V_E	10.24 ± 2.98^{c}	205.61 ± 14.10^{a}	261.69 ± 17.92^{b}
fatty control model	16.74 ± 1.40^{a}	174.17 ± 17.44^{b}	244.46 ± 13.84^{c}
normal control group	9.36 ± 1.89^{c}	198.85 ± 15.21^{ab}	282.42 ± 18.83^{a}

Effect of oat rice wine on mice liver MDA, SOD and GSH-PX activities

GROUPS	MDA（n mol ml^{-1}）	SOD(U ml^{-1})	GSH-PX(U ml^{-1})
oat rice wine(low)	1.68 ± 0.33^{b}	82.27 ± 7.91^{ab}	246.22 ± 14.7^{b}
oat rice wine(medium)	1.78 ± 0.24^{b}	86.89 ± 8.23^{ab}	278.6 ± 17.2^{ab}
oat rice wine(high)	1.70 ± 0.26^{b}	89.96 ± 11.44^{ab}	267.79 ± 17.54^{ab}
V_E	1.66 ± 0.29^{b}	111.86 ± 11.7^{a}	257.82 ± 12.4^{b}
fatty control model	2.21 ± 0.24^{a}	81.81 ± 12.61^{b}	203.98 ± 13.4^{c}
normal control group	2.04 ± 0.26^{ab}	116.70 ± 12.97^{a}	329.60 ± 14.3^{a}

Effect of oat rice wine on mice liver ALT and AST levels

GROUPS	ALT(U ml^{-1})	AST(U ml^{-1})
oat rice wine(low)	76.85 ± 8.50^{bc}	35.9 ± 6.9^{b}
oat rice wine(medium)	68.32 ± 5.70^{c}	31.1 ± 6.6^{b}
oat rice wine(high)	81.12 ± 14.06^{bc}	41.8 ± 12.7^{ab}
V_E	77.33 ± 6.71^{b}	31.5 ± 4.6^{b}
fatty control model	92.38 ± 12.05^{a}	65.2 ± 16.57^{a}
normal control group	89.7 ± 14.2^{ab}	46.1 ± 11.7^{ab}

Conclusion

- Fermented oat foods have the benefit both of oats and fermentation, so spread and increased speedy.
- The market of fermented oat food is still limited, so the potential is very large.
- Oat is a good raw material for production of vinegar or rice wine for its excellent health functions but the research on fermentation oat food is still need.

Oat foods restaurant in Beijing

Welcome to CAU

Welcome to Lab. Of Cereal!

中国农业大学
CHINA AGRICULTURAL UNIVERSITY
1905