

Impact of barley variety and malting process on wort amino acid profile and content

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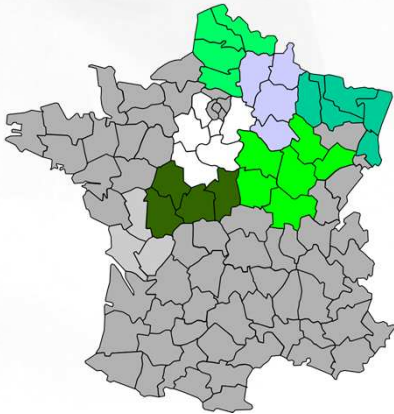
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INTRODUCTION

Free amino nitrogen (FAN) content of wort is measured as indicator of wort suitability for fermentation. FAN consists of individual amino acids, small peptides and ammonia. FAN is sometimes not related with fermentation performance. The concentration of individual amino acids in wort can affect both the rate of fermentation and the flavour production by yeast. The purpose of this work is to study the impact of barley variety and malting process on the AA profile of wort.

SAMPLES ORIGIN & TRANSFORMATIONS

Barley samples from 6 locations over 2 crops



600 grams micro-malting conditions

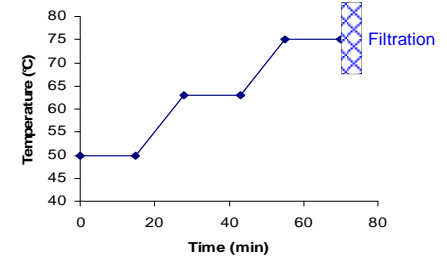
- 2 (SB) or 3 (WB) under-water
- Germination at 16°C for 4 (SB) or 5 (WB) days



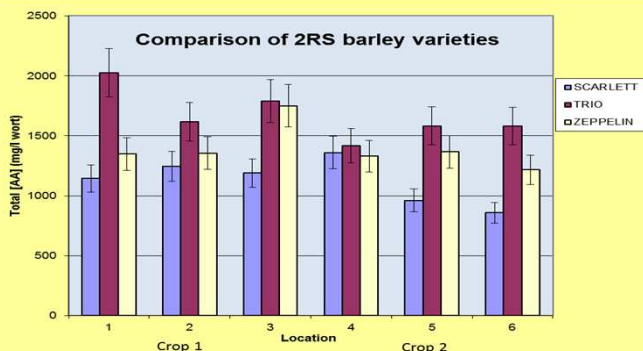
Wort production

Tepral wort

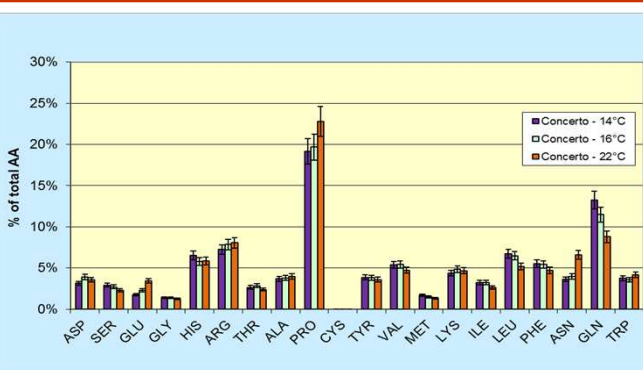
- 11° plato gravity
- Hot filtration & under pressure
- Sparging with hot water
- Mashing regime



DATA COLLECTION & RESULTS



Total AA content of Tepral wort differs between varieties even when results are standardized to the same soluble nitrogen level.



After some steeping, SB variety was germinated at several temperatures. Total AA decrease when T°C increase. Some AA are not impacted by T°C. PRO, ASN & GLN are the more impacted.

ANOVA on AA groups (SB varieties)

| Group A | | | Group B | | |
|--------------|----|-------|--------------|-----|-------|
| SCARLETT | A | 292,8 | SCARLETT | A | 337,4 |
| MAFALDA | AB | 300,6 | MAFALDA | AB | 386,7 |
| SCRABBLE | AB | 309,3 | SCRABBLE | AB | 391,3 |
| SEBASTIAN | AB | 315,2 | SEBASTIAN | ABC | 414,7 |
| DATCHA | AB | 338,5 | DATCHA | ABC | 445,4 |
| PAPRIKA | AB | 339,7 | ZEPPELIN | ABC | 457,5 |
| ZEPPELIN | AB | 340,5 | KWS ALICIANA | ABC | 478,0 |
| KWS ALICIANA | AB | 357,3 | PAPRIKA | BC | 510,5 |
| TRIO | B | 376,3 | TRIO | C | 534,4 |

| Group C | | | Group D | | |
|--------------|----|-------|--------------|----|-------|
| SCARLETT | A | 202,6 | SCARLETT | A | 293,5 |
| MAFALDA | AB | 229,8 | ZEPPELIN | A | 318,5 |
| SCRABBLE | AB | 234,5 | SCRABBLE | A | 318,8 |
| SEBASTIAN | AB | 244,7 | SEBASTIAN | A | 320,1 |
| DATCHA | AB | 257,7 | MAFALDA | A | 332,7 |
| PAPRIKA | AB | 268,6 | PAPRIKA | AB | 364,5 |
| KWS ALICIANA | AB | 268,8 | DATCHA | AB | 380,3 |
| ZEPPELIN | B | 278,1 | KWS ALICIANA | AB | 393,8 |
| TRIO | B | 297,0 | TRIO | B | 461,4 |

ANOVA on AA groups (WB varieties)

| Group A | | | Group B | | |
|------------|-----|-------|------------|----|-------|
| BASILIC | A | 294,5 | BASILIC | A | 383,8 |
| GIGGA | AB | 328,3 | SALAMANDRE | AB | 396,4 |
| SALAMANDRE | ABC | 339,4 | LINDSAY | AB | 402,4 |
| LINDSAY | ABC | 351,8 | GIGGA | AB | 424,9 |
| VANESSA | ABC | 361,0 | ESTEREL | AB | 454,5 |
| ESTEREL | BC | 373,7 | VANESSA | B | 479,2 |
| LIMPID | C | 408,0 | LIMPID | B | 487,2 |

| Group C | | | Group D | | |
|------------|---|-------|------------|----|-------|
| BASILIC | A | 243,3 | GIGGA | A | 196,2 |
| GIGGA | A | 246,6 | ESTEREL | AB | 239,1 |
| SALAMANDRE | A | 247,0 | SALAMANDRE | AB | 249,7 |
| LINDSAY | A | 258,3 | LIMPID | AB | 251,0 |
| ESTEREL | A | 278,0 | LINDSAY | AB | 254,3 |
| VANESSA | A | 278,1 | VANESSA | AB | 263,4 |
| LIMPID | A | 292,7 | BASILIC | B | 269,6 |

ANOVA on AA groups (Jones & Pierce) show significant variety effect. Location and crop have an impact too, but at lower level.

CONCLUSION

Several varieties coming from different locations in France over two crops were micro-malted and brewed. Malting barley variety has an impact on AA concentration of wort. Differences are not due to possible proteolytic profiles between varieties. Germination temperature has an impact on proteolysis and AA composition of wort. Some AA are not affected and their % remains stable. Percentage of GLU, PRO and ASN increase with T°C, whereas it decrease for GLN. The concentration of individual amino acids in wort can affect both the rate of fermentation and the flavour production by yeast. After studying the fermentations at pilot scale of new malting barley varieties, the objective is to determine the un-adapted amino acids profiles that could explain the poor fermentation performances of some cultivars.

(1) : Jones and Pierce. 1964, *J. Inst. Brew*, 70, 307-15.