

Introduction to beverages



Beverages



- Thirst quenching properties
- Value as social drinks
- Enhance pleasure of eating
- Nutritional value
- Medical reasons



Beverage categories



- Non-alcoholic beverages (soft drinks)
 - Non-carbonated, non-alcoholic
 - Tea, coffee
 - Fruit and vegetable juices
 - Mineral water
 - Milk and milk beverages
 - Functional and nutritional beverages
 - Carbonated, non-alcoholic
 - Flavoured fizzy drinks (high carbonation)
 - Sports or isotonic beverages (low carbonation)



Beverage categories

- Alcoholic beverages
 - Carbonated, mildly alcoholic
 - Champagne
 - Beer (low carbonation)
 - Non-carbonated, alcoholic
 - Wine
 - Whisky, Gin & Rum



Tea and coffee



Tea and coffee



- No food value
- Refreshing and stimulating properties
- Contain caffeine
- Grown in tropical or near tropical climate
- Processed to develop flavour after harvest
- Flavour compounds extracted in water for consumption as beverage



Tea



- A beverage which consists of an infusion of the processed and dried leaves of the tea plant, *Camellia sinensis*
- Types
 - Darjeeling -region
 - Breakfast- occasion
 - Earl Grey-flavoured
 - Herbal (tisanes):medicinal, low or negligible caffeine



Tea constituents affecting brewing quality

- Caffeine-stimulating effect
- Tannin-colour and strength, astringency, body
- Essential oil-flavour & aroma



Main classes of tea

- Green (heat inactivation of enzymes causing oxidation)
- Black (enzymatic oxidation allowed)
- Oolong (intermediate where partial oxidation is allowed by delayed heating)



Coffee



- *Coffea arabica, C. canephora, C. liberica*
- Beans are used for consumption after processing
- Structure of cherry
- Production
 - Ripe beans pass through pulping machine
 - Separation of mucilaginous covering on the beans



Coffee processing



- Processors purchase various coffee types and then blend to provide a given taste and flavour suiting a particular market
- Operations
 - Roasting
 - Colour and flavours are developed by roasting green beans at 260 C for 5'
 - Oxidation flavour defects are reduced by using nitrogen atmosphere



Coffee:processing

- Operations (contd)
 - Grinding after cooling
 - Particle size depends on the intended use eg whether
 - Home use in a drip or vacuum brewer
 - Restaurant- large urn
 - Vending machine
 - Instant coffee
 - Particle size influences
 - Brewing time, turbidity etc



Coffee-processing



- **Brewing**
 - Objective: achieve correct strength, flavour
 - Extraction of solids using water
 - Factors affecting strength and flavour
 - Temp
 - Coffee:water ratio
 - Time
 - Rate and extent of mixing
 - Particle size and coffee related variables



Coffee-processing

- **Brewing**
 - Extraction is optimised by determination of soluble solids
 - In a vending machine- use of permeable paper
- **Decaffeination**
 - Caffeine in brewed coffee=75-150 mg/150 mL cup, tea=30-45 mg/ 150 mL, cola=30-65 mg/can (360 mL)



Decaffeination



- Performed on green beans before roasting in order to minimise flavour and aroma defects
- Reduce caffeine to $<0.1\%$
- Methods
 - Water
 - Solvent



Instant coffee



- Made by drying brew
- Steps
 - Extraction
 - Spray or freeze drying



Fruit and vegetable juices



Fruit and vegetable juices

- Fruits
 - Temperate
 - Citrus
 - Apple
 - Pear
 - Others
 - Tropical
 - Pineapple
 - Mango
 - Papaya puree
- Vegetable
 - Carrot
 - Tomato



Citrus juice



- Single strength
- Concentrates



Common treatments

- Clarification

- Removal of excess pulp by centrifugation or by finishers (screens)
- Removal of pectins, starch, gums, proteins, polyphenolics, metal cations and lipids, which otherwise cause haze before or after preservation; enzymes use



Common treatments

- Clarification

- Fining: heating to required temp, addition of enzymes, allowing time for reaction, addition of flocculating agents (gelatin, bentonite, silica-sol)
- Ultrafiltration: very effective with yield in the range of 95-97% than the above methods



Common treatments

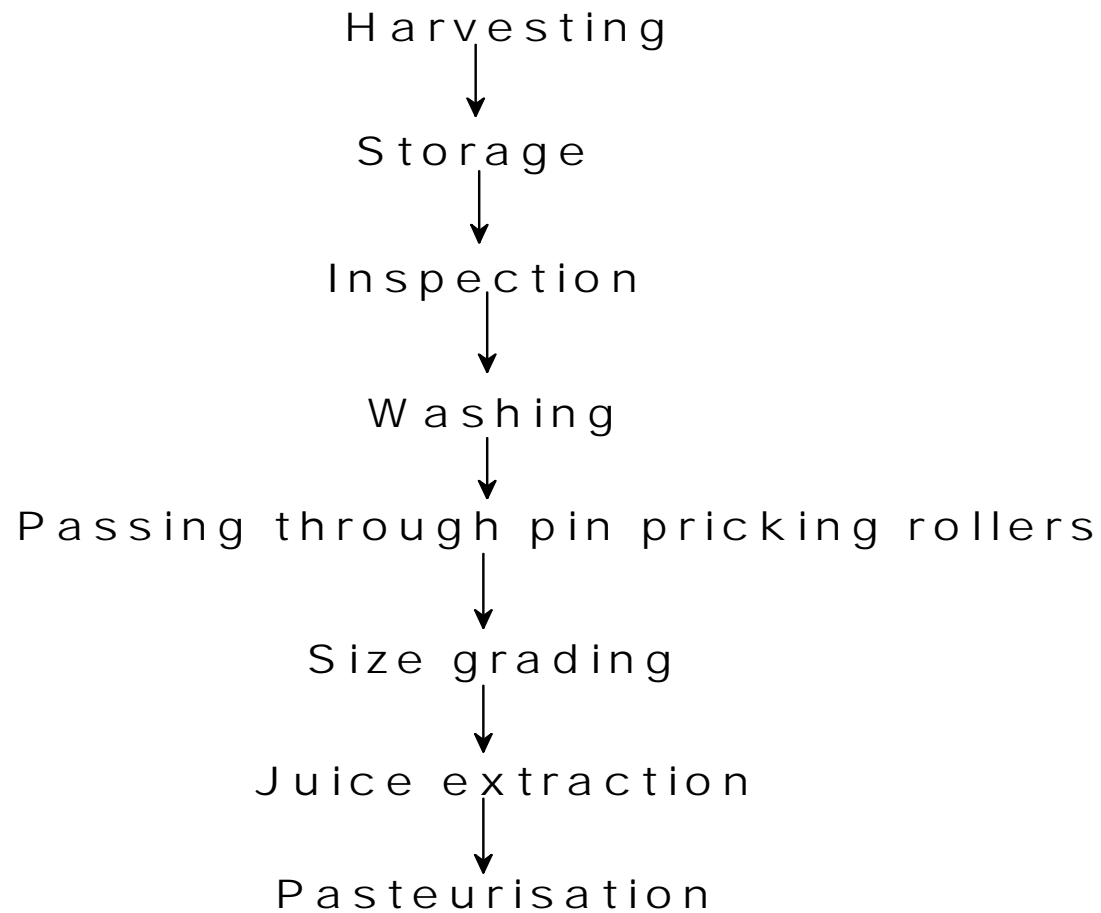
- Preservation methods
 - De-aeration to avoid loss of vitamin C
 - Thermal treatment (Pasteurization)
 - Increase shelf life to 3-4 weeks under refrigeration
 - Stabilization of cloud by inactivating pectolytic enzymes, higher temperature (90-95 C) for 30 s is required



Common treatments

- Thermal treatment (Pasteurisation)
 - Destroying yeasts (*Saccharomyces roxii*) and lactobacillus
- Canning
 - Low heating temp in un-lacquered cans
- Aseptic processing
- Chemical preservatives
 - SO₂ (100 ppm)
 - Sorbate and benzoate mixture (400 ppm)

Juice extraction – flow diagram



Fruit juice products



- Juice: 100% fruit content
- Juice drinks: juice diluted with sugar-acid syrup with acidity up to 1% & suspended solids 10-12%, pH same as juice (3-4)
- Nectars: mixtures of juice, water and sugar with suspended solids content of 25-50%



Carbonated, non-alcoholic beverages



Carbonation



- Antimicrobial
- Sparkle and zest
- Mild acidity development
- Enhances flavour



Alcoholic beverages

Beer

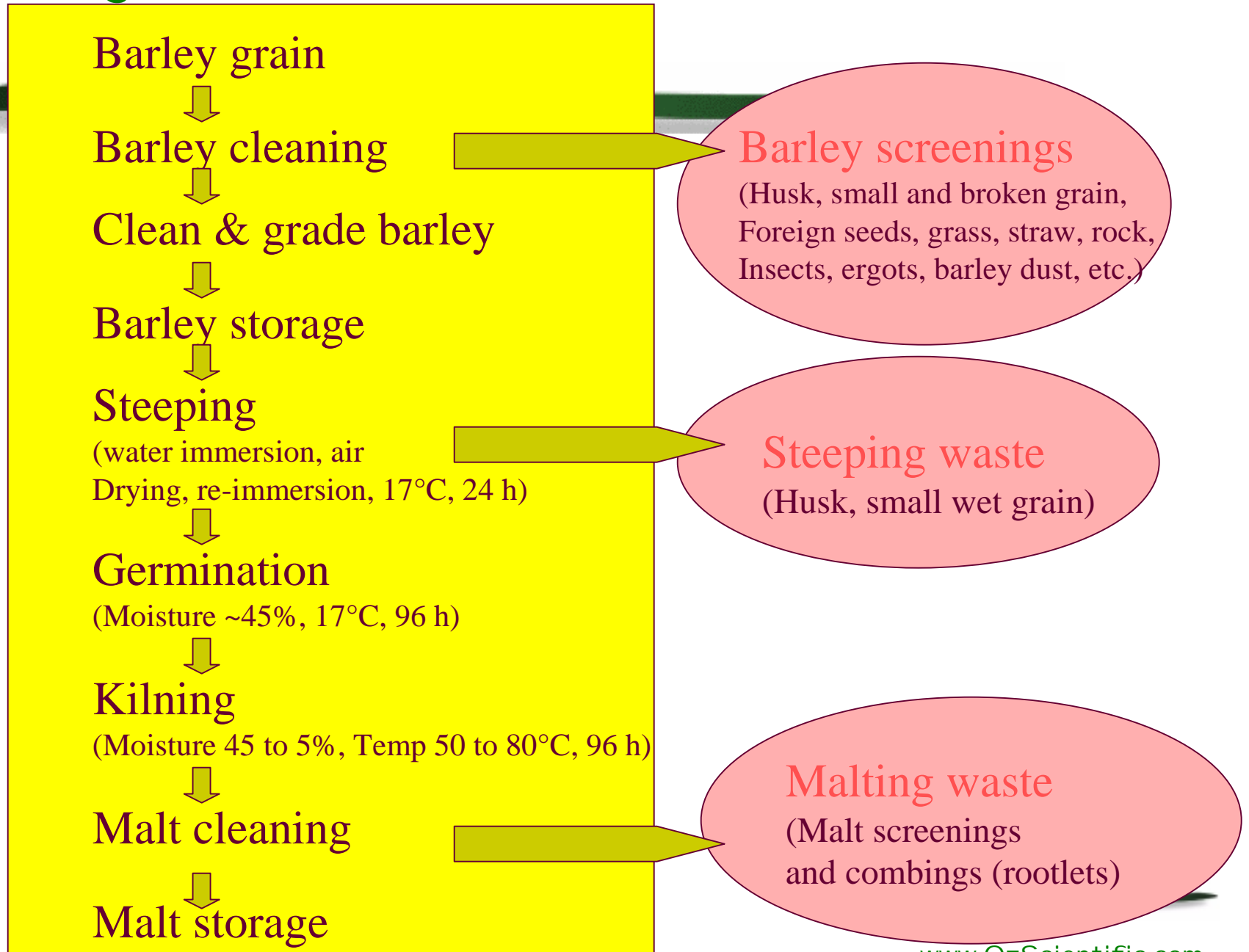
Wine

Distilled sprints

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Malting



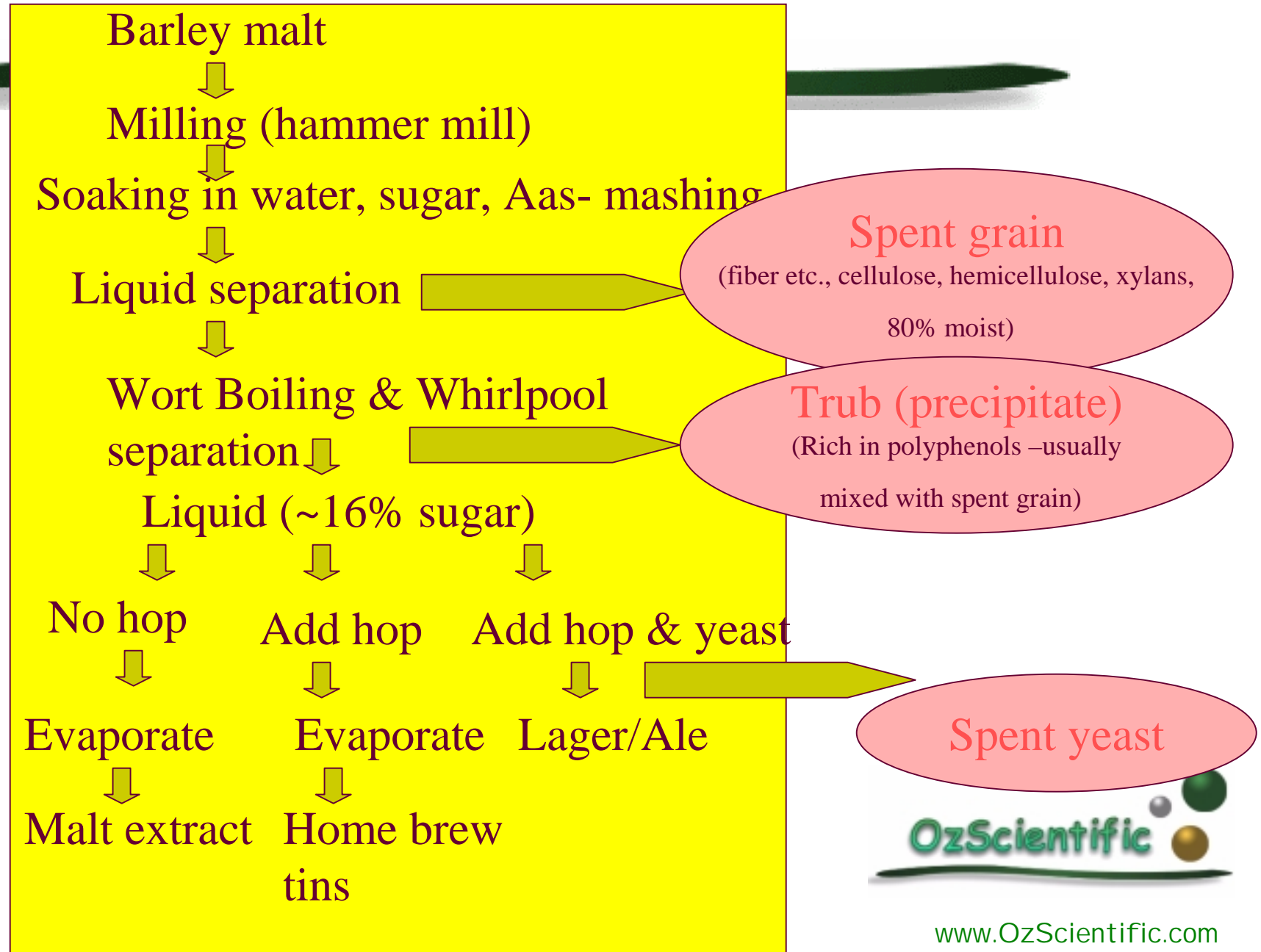
Brewing



- Beer types
 - Differences between ale & lager
 - *Yeast (S.cerevesiae (ale); S. carlsbergensis (lager)*
 - Fermentation (Top fermentation 'ale'; Bottom 'lager')
- Ingredients
 - cereals
 - hops
 - yeast
 - water



Brewing



Mashing



- Mashing process
 - parts
 - process variables
 - Temp, viscosity, water composition & pH
 - types of mashing procedure
 - Traditional infusion (60-65 C)
 - Temp programmed



Wort boiling



- Purpose
 - concentration
 - extraction of hop components
 - destruction of malt or added enzymes
 - removal of undesired volatiles
 - formation of flavour & colour
 - coagulation of protein



Wort clarification & cooling

- Clarification Process
 - Sedimentation or centrifugation
 - Filtration
- Clarification Purpose
 - remove trub (proteins)
- cooling
- Aeration for oxidising haze forming proteins



Maturation



- Processes

- carbonation by fermentation of residual sugars
- removal of excess yeast
- removal of non volatiles by adsorption on yeast surface
- ppt of haze forming substances
- changes in aroma & flavour
- secondary fermentation



Post maturation treatments



- Fining
 - removal of negatively charged yeast, pp by isinglass
- Filtration
- Centrifugation
- Pasteurisation (60 C for 1 min)



Distilled alcoholic drinks

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Whisky



- Definition: potable spirit obtained by distillation of an aqueous infusion of malted barley & other cereals, which have been fermented with *S.cerevisiae*
- Types: classified according to raw materials, distillation method & maturation



Rum



- Fermented product made from sugar cane juice or its by products eg molasses
- Light rums - *S. cerevisiae*
- Heavy rums - *Schizosaccharomyces pombe*
- Continuous or pot distillation



Brandy



- Distillation of grape white wine
- calvados are distilled from cider
- characteristics are defined by grapes, soil, vinification, storage of wine, management practices, climate
- malo-lectic fermentation by Leuconostoc takes place in addition to yeast fermentation



Brandy



- MLF may be desired but should be completed before distillation to avoid aroma changes
- Base wine is stored at low temp (0-5C) to prevent oxidative changes- conversion of glycerol to acetic acid & eventually to acrolein formation (defect)



Brandy

- SO_2 is not added during wine manufacture otherwise:
 - pH is lowered by sulphuric acid
 - formation of acetal due to reaction between etho and acetaldehyde
 - degradation of aromatic quality of brandy
 - damage to still as corrosive action sulphonates, acid formed by reaction of SO_2 and acetaldehyde

Brandy



- Two stage distillation process follows removal of grapes and other particulates
- 1st stage is non-selective producing spirits with (28% etoh), the distillate is distilled again in a selective process yielding:
 - first fraction discarded (containing acetaldehydes)
 - second-brandy
 - third-redistilled



Brandy



- Yeast allowed to remain in the wine for distillation produces favourable fatty acids & other endothelial ester so characteristic of brandy
- matured in new oak barrels



Gins, vodka & related spirits

- Non congeneric
- maturation plays no part in flavour
- gins are flavoured by juniper & other botanicals
- in vodka flavour is modified by passing over charcoal
- any cho material can be used for making



Gins, vodka & related spirits

- Pre-malting of grains is a common practice and use of bacterial amylases (alpha) and fungal (amyloglucosidase) are used
- Yeast fermentation should be carefully controlled
- distillation effected by a battery of column & all congeners are removed



Liqueurs



- Definition: any distilled spirits that is sweetened and/or flavoured substance by comparable taste
- Cream liqueurs: contain milk fat, caseinate, sugar in addition to spirits, mostly whisky
- Oil in water emulsions



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