

Keeping and Natural Conditioning of Cider

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This talk.....

- ... is based on a Keeving Workshop at the Franklin County Cider Day (USA) in November 2005.
- It's been expanded to cover some other topics around “natural conditioning” and to initiate discussion

KEEVING

- The spontaneous (or directed) enzymic clarification of apple (or pear) juice before wild yeast fermentation
 - Typical of high quality English ciders in the 18th and 19th century?
 - Now finds its only widespread commercial application in France

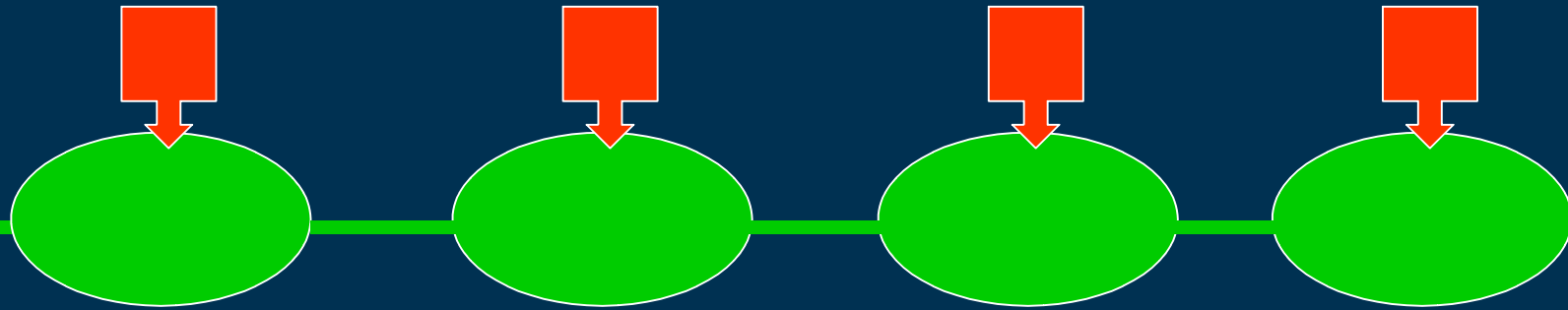
The Purpose

- To reduce the nutrient level in apple juice so it ferments more slowly
 - To produce a superior quality cider
 - To retain natural sweetness by arresting the fermentation before dryness
 - To allow production of sweet sparkling naturally conditioned cider (Normandy style)

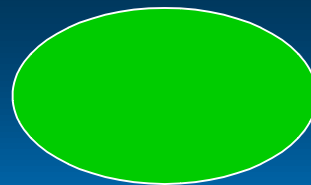
The Players

Component	Origin
Apple Pectin	The apple
Pectin methyl esterase	From apple or added
Wild yeasts	Present everywhere
Calcium	In apples or added
Low temperature	Natural or refrigerator
Asparagine / Thiamin	Yeast nutrients in apple

Apple Pectin

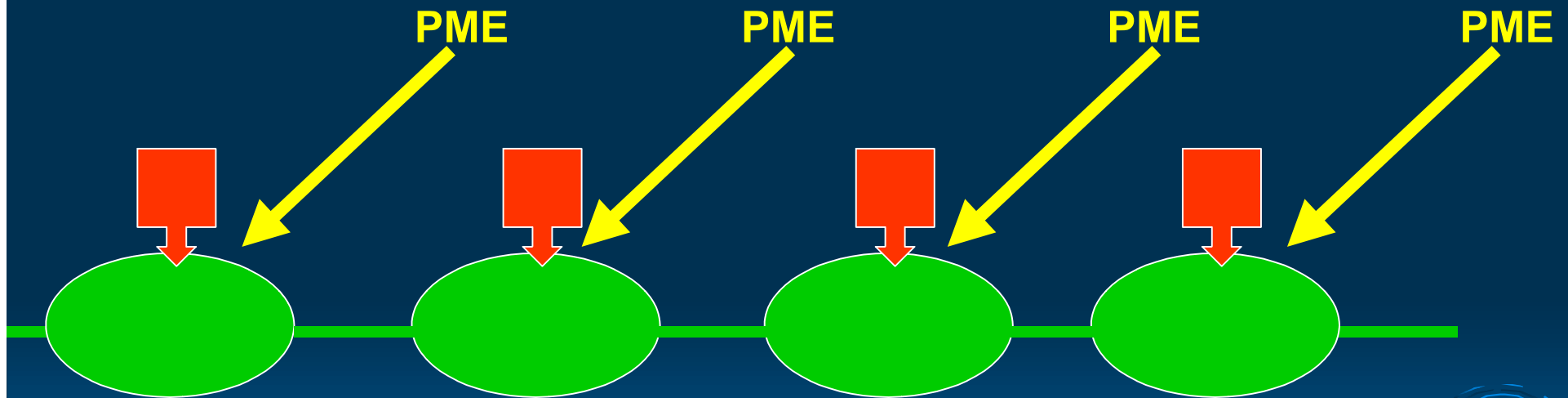


= Methanol

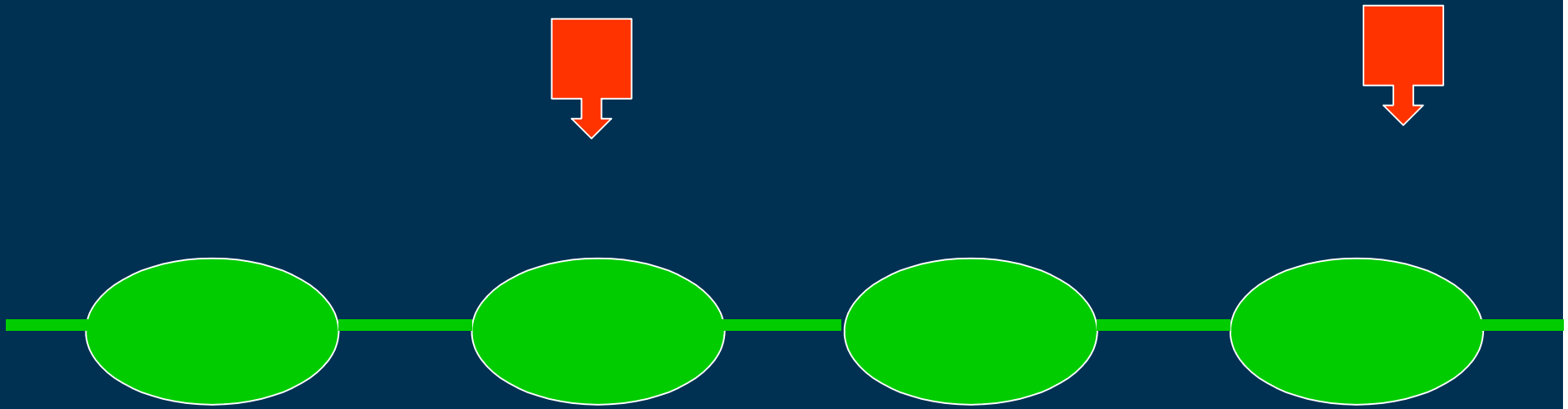


= Galacturonic Acid

Enzymic Demethylation



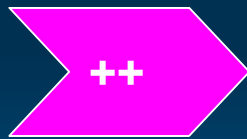
PME = Pectin Methyl Esterase



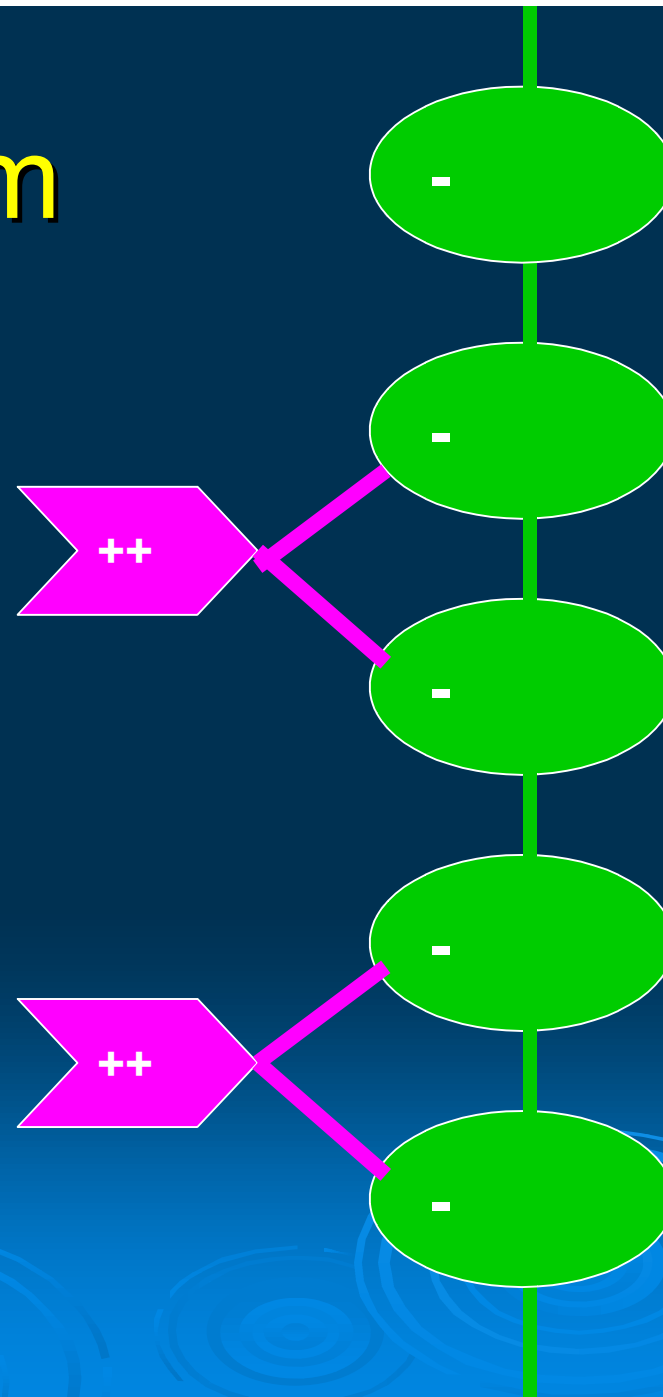
....free poly-Galacturonic acid...

Adding Calcium

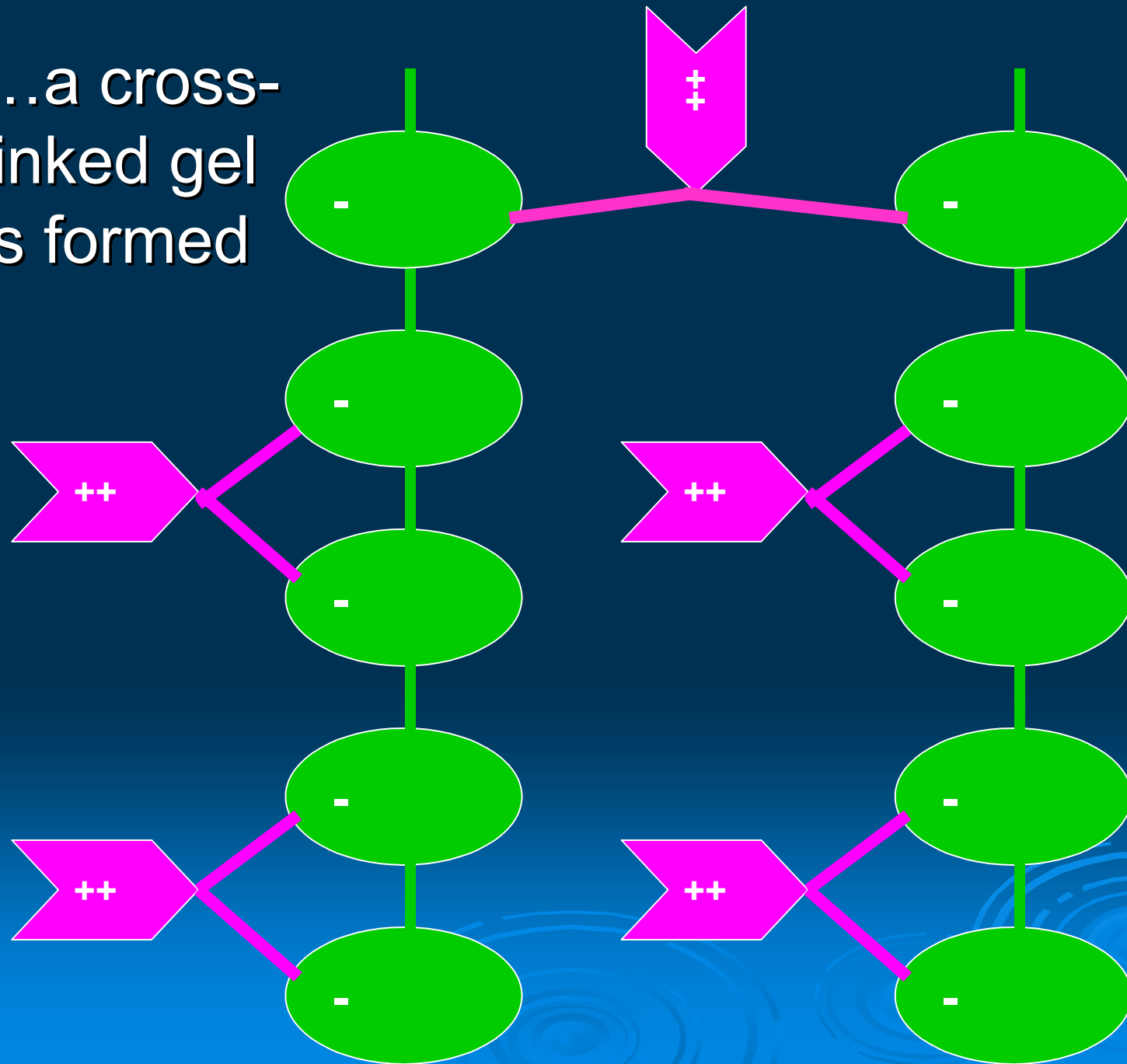
- **poly-Galacturonic Acid** is negatively charged
- **Calcium** is doubly positively charged



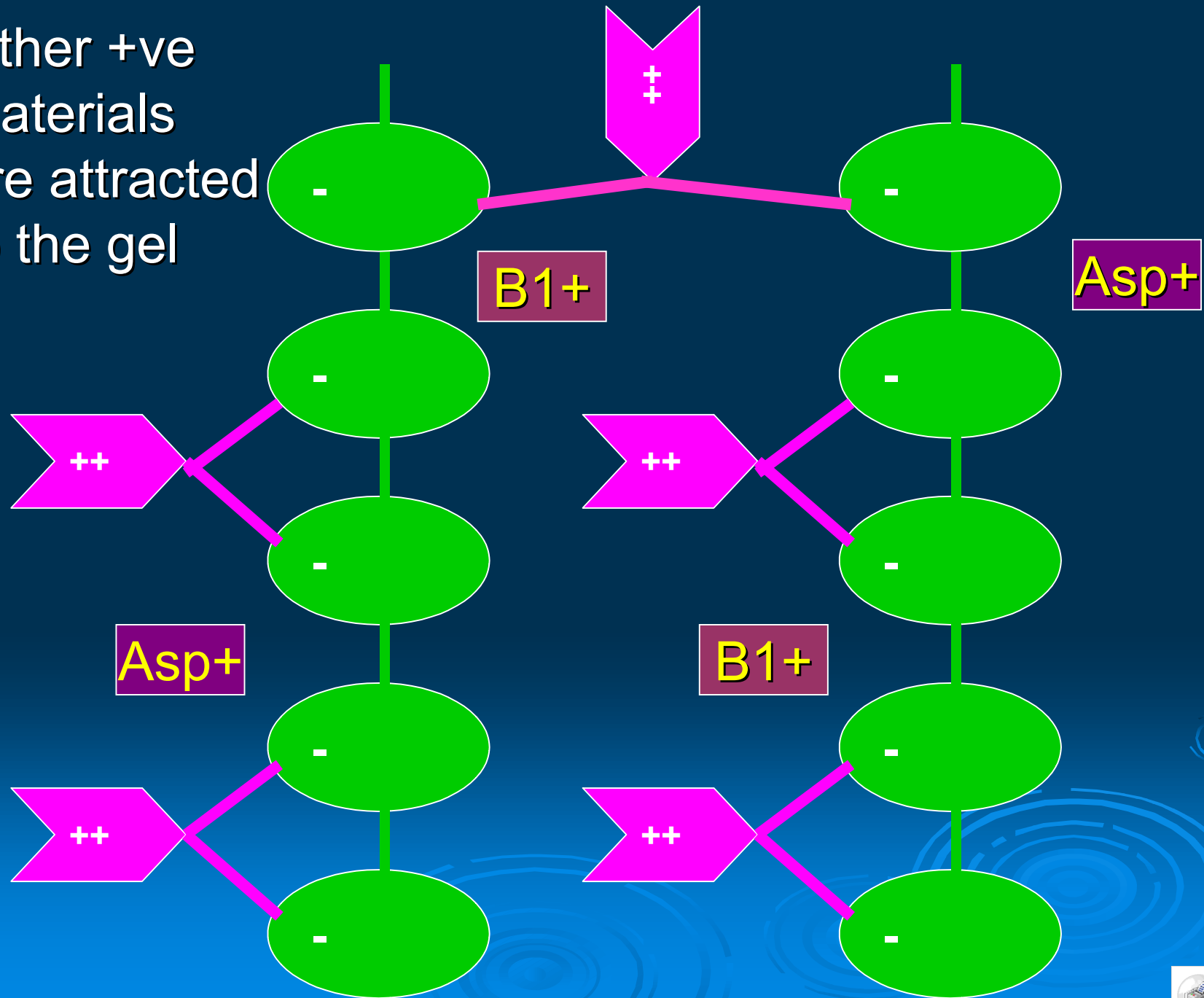
- They come together and...



...a cross-linked gel is formed



Other +ve materials are attracted to the gel



The result

- A cross-linked calcium pectate gel to which other positively charged materials are attracted
 - Asparagine⁺ is the main amino acid in apple juice and is absorbed on the gel
 - Vitamin B1⁺ (thiamin) is also absorbed on the gel
 - These two are important for yeast growth
- Yeast cells are also attracted to the gel

The yeast begins to ferment..

- Gas bubbles are formed and the gel rises up
- When the gel is removed from the juice, it takes much of the yeast and the yeast nutrients with it
- **Result** – a slow and manageable fermentation that might be controllable by racking!



This gives the possibility..

- .. Of the fermentation virtually stopping at eg SG 1.015 because it runs out of non-sugar nutrients
 - If such a cider is bottled it will remain sweet
- Over several months a very slow continued fermentation will make it sparkling
- This fermentation will eventually stop as CO₂ builds up and nutrients are exhausted

Areas of Uncertainty

Problem	Solution
Not enough PME	Add some. But it's a very specialist enzyme
Not enough Calcium	Add it as Calcium Chloride
Not enough Pectin	Macerate before pressing
Not enough yeast activity	Use nitrogen gas flotation! Raise temperature.
Too much yeast activity	Lower temperature. Add sulfite. Don't add yeast or nutrients
Gel too loose and breaks up	A major issue leading to poor yields

Maceration to increase pectin levels

- It's essential to have enough soluble pectin to form a good gel
- Pectin is the glue between apple cell walls
- If fruit is milled and macerated before press (12-24 hr stand) more pectin diffuses into the juice
- Addition of PME during maceration may work to help this
- *Note* – natural PME is in the fruit. Added PME is specially prepared from fungal sources. Available commercially as 'Klercidre'

That is the Normandy Method

➤ It works because:

- Fruit is from low nutrient apples / orchards
- Keiving is integral to the process
- Strong champagne bottles are used
- There is a wealth of empirical knowledge on how to make it work safely and predictably

➤ Most of us in the UK do not have the same historical background

Natural Sparkling Cider

Three Methods

- 1. Normandy Method as discussed
 - slow arrested fermentation
 - “bottle conditioned” contains yeast
- 2. Methode Traditionelle (Champagne, Cava)
 - ferment to dryness
 - add sugar and yeast - referment in bottle
 - disgorge yeast and re-cap to preserve sparkle
 - “bottle fermented” contains no yeast
- 3. Hybrid method as 2 but do not disgorge

Safety Issues (if all sugar ferments out)

SG	Sugar g/l	Pressure atm (psi)	Safe Bottle
1.005	10	3 (45)	Beer (crown cap)
1.010	20	6 (90)	Champagne
1.015	30	9 (135)	None!

Testing for Safety (Pollard and Beech 1957)

- Put a test amount of (SG 1.010) bulk cider in a champagne bottle and wire down top
- Lay down in closed box at 75°F / 25°C for 21 days
- Uncork carefully (goggles?) and assess carbonation level
 - If acceptable - proceed with bulk bottling
 - If cork strains against wire and carbonation is excessive - repeat test every two weeks