

MOLECULAR GASTRONOMY

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7. POWDERIZING

- CONVERT THE FAT LIQUID INTO POWDER
- USING A KNOWN-SUBSTANCE CALLED MALTODEXTRINE (MALTO)
- IN RESTAURANT IT IS USE TO BRING NEW EXPERIENCE TO THE GUESTS AND PROMOTE NEW FLAVOR TO THE FAT CONVERTED

MALTODEXTRINE

- MALTODEXTRIN IS DERIVED FROM STARCH FROM GRAINS SUCH AS CORN OR RICE, TUBERS SUCH AS POTATOES, OR ROOTS SUCH AS TAPIOCA. THIS STARCH IS COMPOSED OF LONG CHAINS OF SUGAR AND IS THE PLANT'S FOOD RESERVE.
- ALTHOUGH THE COMPOSITION OF MALTODEXTRIN IS A BLEND OF SUGAR, ITS SWEETENING POWER IS MUCH WEAKER THAN THAT OF SYRUPS AND TABLE SUGAR!
- IN THE FOOD INDUSTRY, MALTODEXTRIN IS USED TO MAKE SOFT, LOW-FAT BAKERY PRODUCTS. IT ALSO PREVENTS THE FORMATION OF CRYSTALS ON THE SURFACE OF FROZEN FOODS AND IS USED AS A SUGAR SUBSTRATE IN SPORTS DRINKS.
- RATIO MAY VARY BETWEEN 20 – 40 % TO LIQUID FAT



MALTODEXTRINE

- IT ALSO PREVENTS THE FORMATION OF CRYSTALS ON THE SURFACE OF FROZEN FOODS AND IS USED AS A SUGAR SUBSTRATE IN SPORTS DRINKS.
- BESIDES THE FOOD SECTOR, ITS USES ARE DIVERSE. SOME SOAPS USE IT AS AN AROMA CARRIER AND TEXTURIZER. THE PHARMACEUTICAL INDUSTRY USES ITS PROPERTIES TO REDUCE CRYSTALLIZATION IN SYRUPS AND AS A FILLER IN TABLETS.
- MALTODEXTRIN IS ADDED TO BEER TO IMPROVE ITS MOUTHFEEL.
- IT IS A SIGNIFICANT PART OF THE CONTENT OF POWDERED ENERGY DRINKS USED BY ATHLETES.
- IT IS USED IN THE MANUFACTURING OF MANY DRUGS TO IMPROVE TASTE, SHAPE OR SOLUBILITY.
- IT IS CONSIDERED BY NUTRITIONISTS TO BE AN EMPTY SUBSTANCE CONTAINING VIRTUALLY NO CALORIES, VITAMINS OR NUTRIENTS.

8. THICKENING

- AIM TO CHANGE OR ENHANCE THE TEXTURE OF LIQUID FOR MOUTHFEEL PURPOSE
- CONSIST INTO NON HYDROCOLLOID AND HYDROCOLLOID CONSISTENCY
- NON HYDROCOLLOID THICKENER : NUT/GROUND OR TREENUT (STARCH CONTAINED VEG)
 - EX: PINE NUT IN PESTO, POTATO IN MUSHROOM SOUP
- SOME THICKENER WILL WORKS RELATED WITH TEMPERATURE
- THE FINAL FUNCTIONAL PROPERTIES ALL DEAL WITH HOW A THICKENER BEHAVES IN THE PRESENCE OF OTHER THINGS. FOR EXAMPLE, WILL THE THICKENER FUNCTION WHEN USED IN CONJUNCTION WITH **SUGAR, ALCOHOL, AND ACID?**

COMMON TRADITIONAL THICKENER

- TRADITIONAL HYDROCOLLOIDS INCLUDE **FLOUR, CORNSTARCH**. AS ANYONE WHO HAS EVER USED FLOUR TO THICKEN A STEW BEFORE KNOWS, YOU HAVE TO QUICK FLOUR WITH OIL INTO SOMETHING CALLED A ROUX BEFORE YOU CAN USE IT AS A THICKENER. THAT'S BECAUSE FLOUR CAN HYDRATE IN BOTH COLD AND HOT WATER AND CAN QUICKLY FORM LUMPS.
- ANOTHER THICKENER YOU MIGHT NOT THINK YOU RUN INTO EVERYDAY BUT IS AS UBIQUITOUS AS, WELL, FRUIT, IS THE HYDROCOLLOID **PECTIN**. PECTIN IS THE NATURALLY-OCCURRING STRUCTURE-GIVING HYDROCOLLOID FOUND IN MANY FRUITS. IT IS WHAT GIVES JAMS AND JELLIES THEIR THICKNESS.
- AND FINALLY, **SUGAR**. IF YOU THINK THAT IT'S UNCOMMON TO THICKEN A SAUCE WITH SUGAR, REMEMBER THAT ANY **REDUCTION** (FOR EXAMPLE, OF WINE OR VINEGAR) IS ESSENTIALLY THICKENED BY THE RESIDUAL SUGARS LEFT WHEN WATER IS BOILED OFF. SUGAR HAS A NATURAL THICKNESS, ALL THE WAY TO THE POINT WHEN ALL WATER IS REMOVED AND THE SUGAR BECOMES A SOLID. GLUCOSE IS EVEN THICKER THAN SUCROSE (TABLE SUGAR) AND IS USED IN MANY BAKING APPLICATIONS.

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MODERNIST THICKENER

THERE ARE A WIDE VARIETY OF HYDROCOLLOIDS THAT ARE COMMONLY CONSIDERED "MODERNIST," EVEN IF THEY HAVE BEEN USED FOR HUNDREDS OF YEARS. THE APPLICATION OF TECHNOLOGIES TO HAUTE CUISINE IS WHAT USUALLY DEFINES A DISH AS MODERNIST.

- **XANTHAN GUM** IS WIDELY AND CHEAPLY AVAILABLE. ALTHOUGH XANTHAN CAN BE USED IN TRADITIONAL COOKING TO SLIGHTLY THICKEN SAUCES, GRAVIES, AND STEWS, IT REALLY SHINES WHEN USED IN COMBINATION WITH OTHER HYDROCOLLOIDS.
- **KUZU ROOT STARCH** IS EXTRACTED FROM THE STARCH OF THE KUZU OR KUDZU PLANT IN JAPAN.
- **AGAR AGAR** IS EXTRACTED FROM CERTAIN SPECIES OF RED ALGAE AND IS COMMONLY USED IN ASIAN COOKING.
- **LOCUST BEAN GUM** IS DERIVED FROM THE STARCHY LOCUST BEAN AND HAS LONG BEEN USED IN THE MEDITERRANEAN TO THICKEN FOODS. MODERN PROCESSED VERSIONS OF THE GUM HAVE MADE ITS CONSISTENCY MORE FINE AND ITS TASTE MORE NEUTRAL.

XANTHAN GUM: ORIGIN

- FROM THE BACTERIUM : *XANTHOMONAS CAMPESTRIS*. THE BACTERIA CONSUMES SUGARS AND FERMENTS IT INTO A NATURALLY THICK, MUCUS-LIKE SUBSTANCE. THAT MATERIAL IS THEN PROCESSED INTO A CREAM-COLORED POWDER
- FIRST DEVELOPED IN THE 1950S AT THE NORTHERN REGIONAL RESEARCH LABS OF THE USDA. IT WAS PRODUCED COMMERCIALY STARTING IN THE MID-1960S AND APPROVED FOR FOOD USE IN THE UNITED STATES IN 1969
- IT WAS ORIGINALLY DESIGNED TO USE UP EXCESS LACTOSE SUGARS THAT WERE CREATED AS A BYPRODUCT OF CHEESE PRODUCTION, BUT CAN ALSO BE DERIVED FROM CORN, SOY, OR WHEAT. THE SPECIFIC STRAIN OF BACTERIA USED IN FERMENTATION AND THE PROCESSING REQUIRED VARY BY SOURCE.
- XANTHAN IS FOUND IN A WIDE VARIETY OF FOODS. FOR EXAMPLE, A SMALL QUANTITY OF THE GUM IS OFTEN ADDED TO ICED SMOOTHIE RECIPES TO GIVE THE DRINKS A CREAMY TEXTURE AND TO HELP ICE CHUNKS STAY DISPERSED.

XANTHAN GUM: FUNCTION

- XANTHAN DRASTICALLY INCREASES THE VISCOSITY (THICKNESS) OF ANY LIQUID IT IS ADDED TO IN VERY LOW CONCENTRATIONS. IN HIGH CONCENTRATIONS, IT WILL FORM A MUCUSY PASTE THAT LOOKS LIKE A GEL BUT IS NOT TECHNICALLY A GEL. IT DOES, HOWEVER, FORM A GEL WHEN COMBINED WITH LOCUST BEAN GUM
- XANTHAN GUM'S REAL BENEFITS COME THROUGH ITS INTERACTIONS WITH OTHER INGREDIENTS. BY INCREASING THE VISCOSITY OF LIQUIDS, IT HELPS TO PREVENT SYNERESIS (WEEPING) IN GELS, KEEP ICE CRYSTALS FROM FORMING IN FROZEN GOODS, AND HELP STABILIZE EMULSIONS AND FOAMS. XANTHAN IS A POPULAR INGREDIENT IN GLUTEN-FREE FOODS BECAUSE IT CAN IMPART SOME OF THE TEXTURE THAT GLUTEN GIVES TO BAKED GOODS.

XANTHAN GUM: APPLICATION

- **DIETARY RESTRICTION:** GLUTEN-FREE
- **TEMPERATURE :** WILL HYDRATE AT ANY TEMPERATURE. YES, IT'S THAT AWESOME.
- **TEXTURE:** IN SMALL QUANTITIES, XANTHAN WILL ADD SLIGHT BODY AND VISCOSITY TO ANY LIQUID. ADD TOO MUCH, HOWEVER, AND A XANTHAN-THICKENED MIXTURE RUNS THE RISK OF BECOMING SLIMEY, WITH A TEXTURE LIKE MUCUS. FOR THICKER APPLICATIONS SUCH AS STEWS OR PUDDINGS, WE WOULD RECOMMEND USING A DIFFERENT THICKENER. IN VERY HIGH CONCENTRATIONS, XANTHAN-THICKENED MIXTURES TURN INTO STICKY PASTES.
- **APPEARANCE:** CLEAR, THOUGH SINCE XANTHAN STABILIZES EMULSIONS, IT'S VERY EASY TO TRAP AIR BUBBLES INTO A THICKENED MIXTURE THAT WILL NEVER ESCAPE, WHICH MEANS THAT YOUR MIXTURE COULD BECOME CLOUDY.
- **FLAVOR RELEASE:** GOOD.
- **MOUTHFEEL:** RICH, CREAMY, AND SMOOTH IN SMALL QUANTITIES. MUCUS-LIKE AT HIGHER CONCENTRATIONS.
- **FREEZE / THAW STABLE:** N/A, THOUGH XANTHAN CAN BE USED TO STABILIZE FROZEN APPLICATIONS.

XANTHAN GUM: APPLICATION

- **PH TOLERANCE:** FUNCTIONS AT ALL REASONABLE PH'S (1-13).
- **OTHER TOLERANCES:** TOLERATES ALCOHOL UP TO 60%, SALTS, AND ENZYMES. WILL NOT HYDRATE PROPERLY WITH SUGAR CONCENTRATIONS GREATER THAN 60%.
- **SYNERGIES WITH OTHER INGREDIENTS:** CAN BE USED IN PRACTICALLY ANY MODERNIST RECIPE TO INCREASE VISCOSITY, WHICH IN TURN CAN STABILIZE EMULSIONS, STRENGTHEN GELS, AND FORTIFY FOAMS. XANTHAN INCREASES THICKENING POWER WHEN USED WITH GUAR GUM AND CARRAGEENAN AND WILL FORM A GEL WITH LOCUST BEAN GUM OR KONJAC.

XANTHAN GUM: APPLICATION

- **CONCENTRATION RANGE:** 0.05-0.15% TO SLIGHTLY THICKEN SMOOTHIES, 0.25%-0.5% FOR THIN SAUCES, UP TO 0.8% WILL CREATE A SYRUPY TEXTURE. HIGHER CONCENTRATIONS MAY BE USED IN BAKED GOODS AND FOR OTHER SPECIAL APPLICATIONS.
- **DISPERSION:** DISPERSES AT ANY TEMPERATURE. MAY FORM CLUMPS IF USING VERY COLD WATER, THOUGH THIS WILL USUALLY RESOLVE ITSELF OVER TIME AND CAN BE AIDED WITH OIL, SUGAR, ALCOHOL, OR SOME MIXING
- **HYDRATION:** OCCURS AT ANY TEMPERATURE.