

²WHEAT

SOLUBILITY, INTERACTIONS WITH DIFFERENT SOLVENTS AND RAW MATERIALS

Solvents are substances used to dissolve other substances, of which water is the best known and most commonly used for dissolving food products, followed by ethanol and oil.

The production technology of ²WHEAT is closely related to ethanol, so this solvent was not used, but the interaction of water and oil with the product was examined.

Protein concentrates are often used by consumers with various dairy and sour milk products, as well as with juices, so their interaction with ²WHEAT was evaluated.



Figure 1. ²WHEAT mix with solvents:

from left to right - with cold water, with boiling water, with oil, with cow's milk, with oat milk, with yogurt, with kefir, with orange juice, with apple juice, with vinegar.

²WHEAT during the production process, part of the proteins have denatured and, so to speak, have been encapsulated, as a result of which their solubility and swelling have been changed, in addition, the high fiber content affects the density and has a significant effect on the layering speed, layer thickness, as well as sensory sensation.



Figure 2. ²WHEAT mix with solvents: from left to right - with cold water, with boiling water, with oil, with cow's milk, with oat milk, with yogurt, with kefir, with orange juice, with apple juice, with vinegar.

SOLUBILITY AND pH

When evaluating the solubility in various solvents and raw materials with different environmental pH (acidic to neutral), it was possible to observe that their pH changed significantly when in contact with ²WHEAT - it decreased or became more acidic, this change can be observed especially when ²WHEAT interacts with a neutral solvent (water) or close to neutral (oil and milk - both cow and vegetable). If the product (for example, juices - orange, apple) itself has a very low pH (below 4), then in contact with ²WHEAT the pH changes are not significant, but for a solution such as vinegar (9%), which is very acidic (2.39), its acidity with ²WHEAT is reduced.

SOLUBILITY AND LAYERING

When ²WHEAT is mixed with different liquids - water (cold and boiling), oil, cow's milk (2.5%), vegetable milk (oats), kefir, yogurt, orange juice, apple juice, different delamination rates can be observed.

The fastest layering happens with water (both cold and boiling), which in terms of time also happens very quickly, you can say - immediately after mixing, which is due to the fact that ²WHEAT contains not only proteins, but also fibers in abundance, and in relation to water, they have higher density. The temperature of the water in this situation only has such a big effect that the layer containing the water is colored a brighter color because the color pigments from the ²WHEAT concentrate have been transferred to the water due to the temperature.

Cow's milk integrates relatively well into the ²WHEAT concentrate, but it also has a relatively fast shedding due to its high fiber content.

Compared to water and milk, ²WHEAT stratifies slowly in oil (grape seed, refined) and due to the dissolution of individual ²WHEAT fractions, distinct stratification layers do not form.

Looking at the interaction of plant milk with ²WHEAT in terms of layering, it can be seen that layering is slow, but whether or not the plant milk has added sugar is critical. If no sugar is added, the layering happens faster, but added sugar slows down the process even more.

On the other hand, when sour milk products are mixed with ²WHEAT, their stratification does not actually occur due to the similar density of these two products.

Looking at the interaction of juice (orange and apple) with ²WHEAT, the sugar added to the juice plays an important role here as well. Since orange juice is obtained from concentrate and has sugar added to it, it stratifies relatively slowly when mixed with ²WHEAT, which in turn is different if the juice is naturally obtained, without additional added sugar and mixed with ²WHEAT, stratifies moderately quickly.

If you evaluate the fact itself, whether ²WHEAT is soluble, then it should be said that it is not soluble in water, plant milks, juice, but partial dissolution occurs in oil, sour milk products and cow's milk, which is related to the fat content and density of these products.

LAYERING AND LAYER THICKNESS

²WHEAT mixed well with sour milk products (such as kefir and yogurt) and liquids with sugar (such as orange juice) and delamination was not observed at all (kefir) or after a considerable time (orange juice from concentrate).

The thickness of the solids layer was highest for ²WHEAT with orange juice from concentrate, which was contributed by the fiber content of ²WHEAT and the sugar content of the juice, followed by ²WHEAT with plant milk containing sugar.

The next thickest layers of solids were cow's milk, water, apple juice and vinegar.

Several layers are formed when ²WHEAT is mixed with oil, then the layer of solid particles is about half that of, for example, a mixture with water, which is formed by insoluble fibers. On the other hand, soluble fiber and partially dissolved proteins can be observed in the second layer, which is the widest of all three layers.

Solvents:	pH for raw materials (solvents)	pH solvent + ² WHEAT	stratification rate	stratification, solid particle layer thickness, cm	Solubility	² WHEAT particle size / structure	² WHEAT sensing of particles after contact with the solvent
Water (20 degrees)	7.00	4.32	very fast – 1	2	does not dissolve	² WHEAT swells and becomes soft	taste like soaked, swollen rye bread
Water-boiling (100 degrees)	7.00	4.32	very fast – 1	2	does not dissolve	² WHEAT swells and becomes soft	taste like soaked, swollen rye bread
Oil	6.81	4.04	slow – 3	1.1	partially soluble	² WHEAT partially dissolves and this part forms a homogeneous mass, while the other part of ² WHEAT does not swell and forms a layer of solid particles at the bottom of the container	the hard fiber particles that irritate the throat like sand, the taste is oily, this part alone is not enjoyable
Milk - cow 2.5%	6.68	5.13	medium fast – 2	2.1	partially soluble	² WHEAT swells and becomes soft, soft structure	² WHEAT goes well with milk to taste, it develops a mild taste
Milk - vegetable - oat - self-made	6.78	4.38	slow – 3	2.3	does not dissolve	² WHEAT swells and becomes soft, soft structure	² WHEAT goes well with oat milk in terms of taste, only the taste is a little more sour than with cow's milk
Milk - vegetable - rice-almond - shop	6.62	4.49	very slow – 4	N	does not dissolve	² WHEAT swells and becomes soft, soft structure	² WHEAT goes well with rice-almond milk according to taste, the taste is sweet and sour, because plant milk contains sugar
Kefir 2.5%	4.41	4.32	does not happen	N	partially soluble	² WHEAT swells and becomes soft, but the particles are harder than milk-ripened	very sour in taste, additional raw materials are needed to neutralize the acid
Yogurt	5.12	5.01	does not happen	N	partially soluble	² WHEAT swells and becomes soft, soft structure	² WHEAT goes well with yogurt according to taste, the taste is sweet and sour, because solvent contains sugar
juice-orange	3.87	4.00	slow – 3	2.5	does not dissolve	² WHEAT swells and becomes soft	refreshing sour taste with a distinct orange flavor
juice-apple	3.59	3.89	medium fast – 2	2	does not dissolve	² WHEAT swells and becomes soft	balanced, briskly sweet and sour taste, tasty and enjoyable

3. Table ²WHEAT solubility evaluation

SOLUBILITY AND RIPENING OF CONCENTRATE

²WHEAT during the production process, part of the proteins have denatured and, so to speak, have been encapsulated, as a result of which their solubility has been disturbed and, therefore, the possibility of ripening has been reduced.

When ²WHEAT interacts with liquids such as water, juices, vinegar, protein concentrate partially absorbs the liquid and swells, its structure changes - it becomes soft.

On the other hand, due to the presence of fat, mixing liquids such as cow's milk and vegetable milk with ²WHEAT causes the concentrate to ripen and become soft, moreover, these ripened particles have a soft structure, which cannot be said for the interaction of ²WHEAT with sour milk products and oil, in which partial dissolution of soluble fibers occurs and insoluble fibers are more pronounced, forming a harder fraction sediment, which is particularly pronounced in the ²WHEAT mixture with oil.

SOLUBILITY AND SENSORY

When ²WHEAT is mixed with any of the liquids, it changes the taste of the protein concentrate and most often takes over the taste characteristic of the specific liquid or associations with a product are formed in the interaction. For example, mixing ²WHEAT with water creates a taste that can be compared to rye bread - soaked and swollen, and the sour aroma also strengthens this association.

²WHEAT soaked in cow's milk creates a nice mild flavor and has good potential for this type of application with this type of protein concentrate. ²WHEAT goes well with plant milks, judging by pure taste sensors, and when plant milk has no sugar added, it is slightly more sour than ²WHEAT mixed with cow's milk, but the taste develops sweet and sour when plant milk contains sugar.

A very sour taste is formed when ²WHEAT is soaked in kefir, and in order for the product to be sensory pleasure, it must be supplemented with some other raw material that would neutralize this increased acidity. ²WHEAT goes well with yogurt, it gives pleasant taste and structure.

A pleasant taste and therefore a great potential for application is ²WHEAT when mixed with juices, the taste of which is perfectly absorbed by the protein concentrate. For example, orange juice, which initially associates and is sour, interacts with the protein concentrate to form a very pleasant refreshingly sour, orange-like taste. When ²WHEAT is mixed with apple juice, the taste of mature protein particles is well-balanced, briskly sweet and sour and enjoyable for the senses.



Figure 3. ²WHEAT mixture with solvents: from left to right ²WHEAT - with cold water, with boiling water, with oil, with cow's milk, with oat milk, with yogurt, with kefir, with orange juice, with apple juice, with 9% vinegar.

PRODUCER: "I.S.D." SIA

Baldones street 2, Iecava, Bauska Municipality, Latvia, LV 3913

VAT No. LV 40003356850

E-mail: nora@2-wheat.com

Phone: +371 67896322