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# SEARCHING FOR THE LIMIT YIELD STRESS OF LIQUID SOURDOUGH

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For identifying best optimal properties of controlling dispersed structures it's necessary to establish the mechanism and kinetics of the formation and destruction of the spatial structural grid, i.e. kinetics of interaction of the solid particles of flour, water and gaseous medium from the time of separations surface emergence between them until complete distribution of the initial phases.

Due to the contact of flour particles in dough, they have to overcome the energetic barrier, that's why structured systems of that type characterized by yield stress (yield point) [1].

The limit yield value refers to the integral characteristics which understands as structural and mechanical properties of the whole system as a set of interacting phases, i.e. a characteristic, which define the amount of elementary contact interactions between particles of the dispersed phase in the test volume of the disperse system. When a static load equal to the limit yield value ($\tau_{lim}$) structure is destroyed and the shear strain is observed.

There was used technique, which allows to determine the deformation characteristics of non-destroyed structure during very low (but variable) rapidities.

The liquid new sourdough with humidity of 65 % and a temperature of 28 °C was investigated. Such a technological parameters are related to the fact that during preparation of such a semi-product as sourdough is, it's necessary to make the largest possible amount of flour [2]. At 65 % humidity it contains approximately 40 % of the flour, and at 75 % humidity - only 30 %.

High humidity reduces amount of of fermentative flour, which is brought to dough with the sourdough and yeast living conditions get worse [3].

To determine the shearing stress was used a rheometry absolute method, precisely a rotating rheometer «Rheotest 2» with controlled speed of shear. During using the device for the detection of low voltages there was used system of measurement $S/S_1$ (a constant, which equal 0,594 Pa). These results are presented in Table 1.

**Table 1 – The shearing stress of the liquid wheat sourdough**

| Shear rate $01\dot{\gamma}$, $sec^{-1}$ | Took readings, $\alpha$ | Shearing stress $\tau$, Pa |
|---|---|---|
| 0,5 | 4,9 | 2,9302 |
| 0,9 | 5,6 | 3,3124 |
| 1,0 | 6,0 | 3,5672 |
| 1,5 | 6,1 | 3,6234 |
| 2,7 | 7,3 | 4,3362 |
| 3 | 9,1 | 5,4054 |
| 4,5 | 9,9 | 5,8806 |
| 5,4 | 10,5 | 6,237 |
| 8,1 | 13,2 | 7,8408 |
| 9 | 13,8 | 8,1972 |
| 13,5 | 16,2 | 9,6228 |
| 16,2 | 18,1 | 10,7514 |
| 24,3 | 23,8 | 14,1372 |
| 27 | 24,9 | 14,7906 |

Next, the sourdough flow curve was based on the obtained results. For finding specific values of limit shearing stress was builded double logarithmic flow curve, fig. 1.

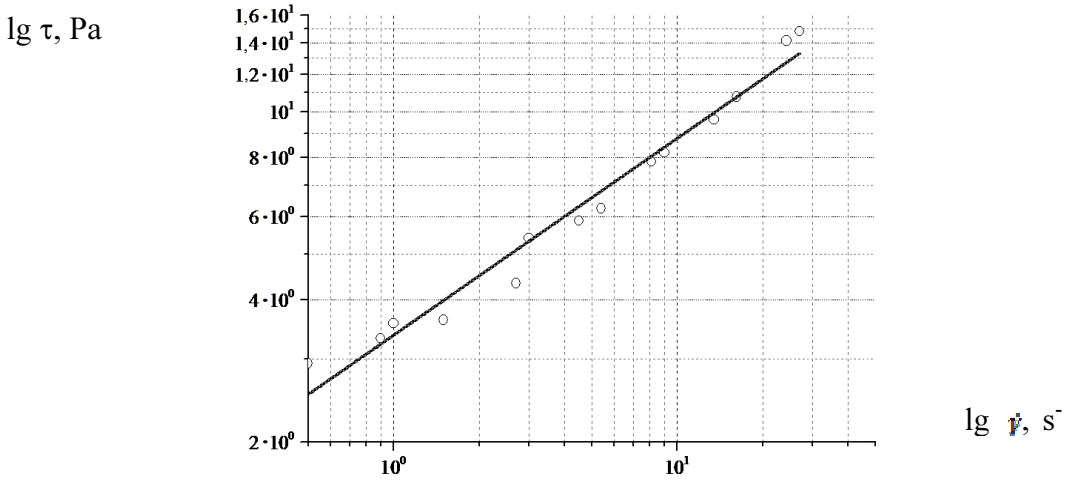


**Fig. 1 – Double logarithmic flow of sourdough curve**

Analyzing the curves plotted in logarithmic coordinates, you can get two parameters describing the structural and mechanical properties of the liquid sourdough. Precisely, flow index is numerically equal to the tangent of linear dependence lg $\tau$ – lg $\dot{\gamma}$ graphs angle slope.

The second parameter, which is the aim of our research, is a segment on the y-axis which is cutted by the resulting curve. Its value is numerically equal to (lim ≈ 2 Pa. This value indicates that there is no sourdough flowing and external effects can't disrupts it's structure. With further increase in voltage, when $\tau > \tau_{lim}$, system begins to flow. Migration speed in this case is negligible, the connection between the particles after their destruction recovers again.

We can surmise that the liquid opara with a 65 % humidity has a limit shearing stress, although its value is so small, so that can be ignored. Taking $\tau_{lim} = 0$, the sourdough can be identified as a pseudoplastic fluid. Pseudoplastic flow and pseudo-plastic fluid are related to the fact that the yield stress is zero.

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## EVALUATION OF WINTER WHEAT VARIETIES BY FLOUR YEILD WITH GRAIN YIELD

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The main assessment grade is the value of the performance and quality of grain, however, not always high yield corresponds to the high output of the ready product during

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