



УНИВЕРСИТЕТ ИТМО

**DEVELOPMENT OF SHORT GERMINATION MALT TECHNOLOGY FROM  
VYATSKY NAKED OATS**

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## Aims and objectives



**Aim** is to develop an energy-efficient technology of malt germination from naked oat;

**Objective** is to study the dependence of accumulation of the enzymatic activity in oat malt (cytolytic, proteolytic and amylolytic) for various modes of malting;

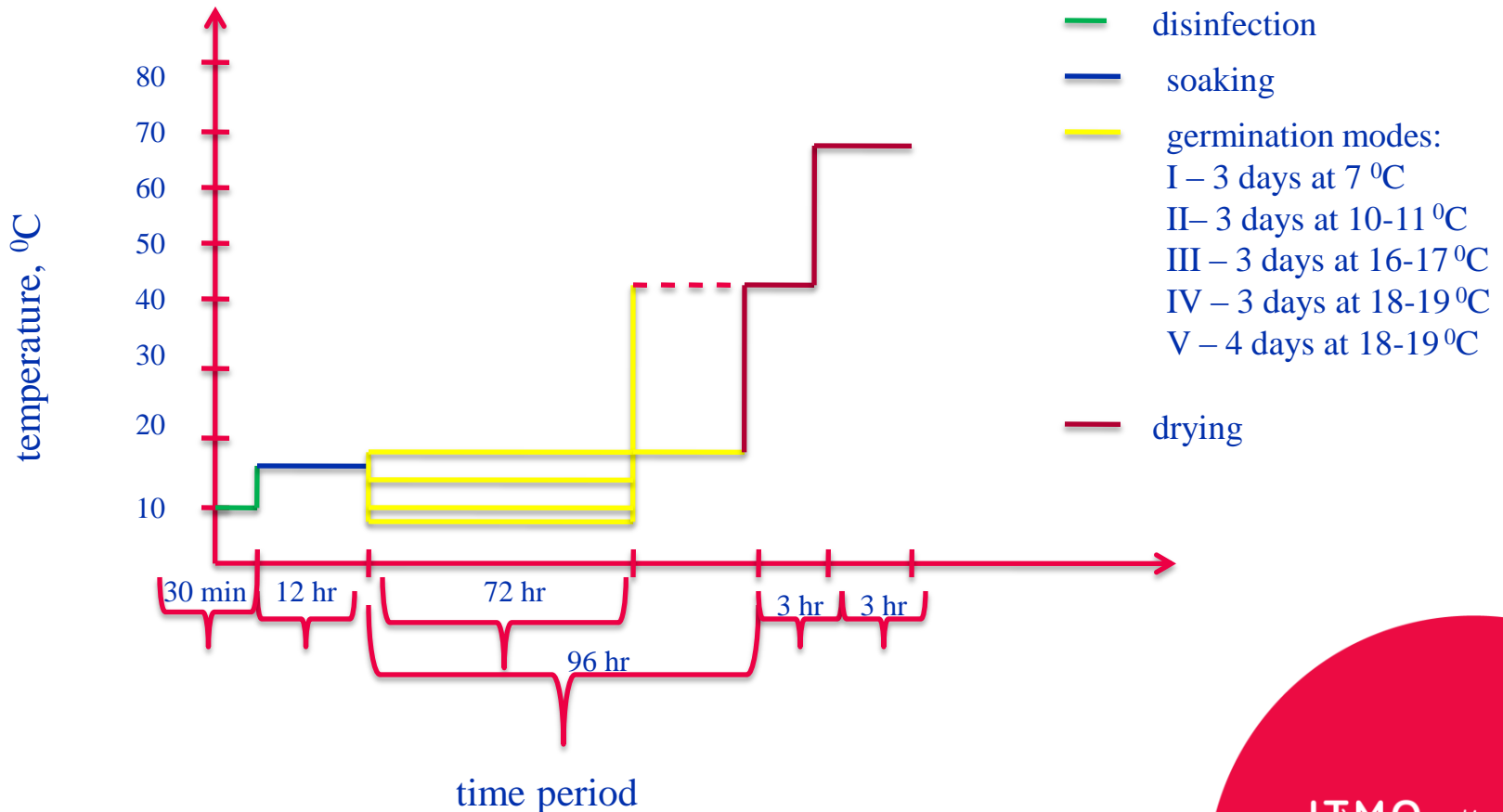
## Objects and methods of research

**Objects of research:** gluten-free naked oat from Vyatsky Agricultural Research Institute of the North East, the seeds of the crop 2014; gluten industrial oat malt, Castle Malting manufactured, Belgium; malt samples obtained from these oat varieties;

### **Methods of research:**

➤Moisture content in malt, the mass fraction of extract of fine and coarse grind, the mass fraction of soluble protein, calculation of Kolbah number, Duration of malt saccharification, color definition for laboratory wort was examined according to GOST 29294-92 "Barley malt for brewery"; length of germinal leaf, Hartong`s number, the amount of beta-glucan, concentration of free amino nitrogen in the wort was measured according to European Brewery Convention (EBC) method; grain viability was determined according to GOST 12039-82 "Seeds of agricultural crops"; energy grain germination was determined according to GOST 10968-88 "Grain. Methods for determining germination energy and germination capacity ";

# Germination technology from Vyatsky naked oat

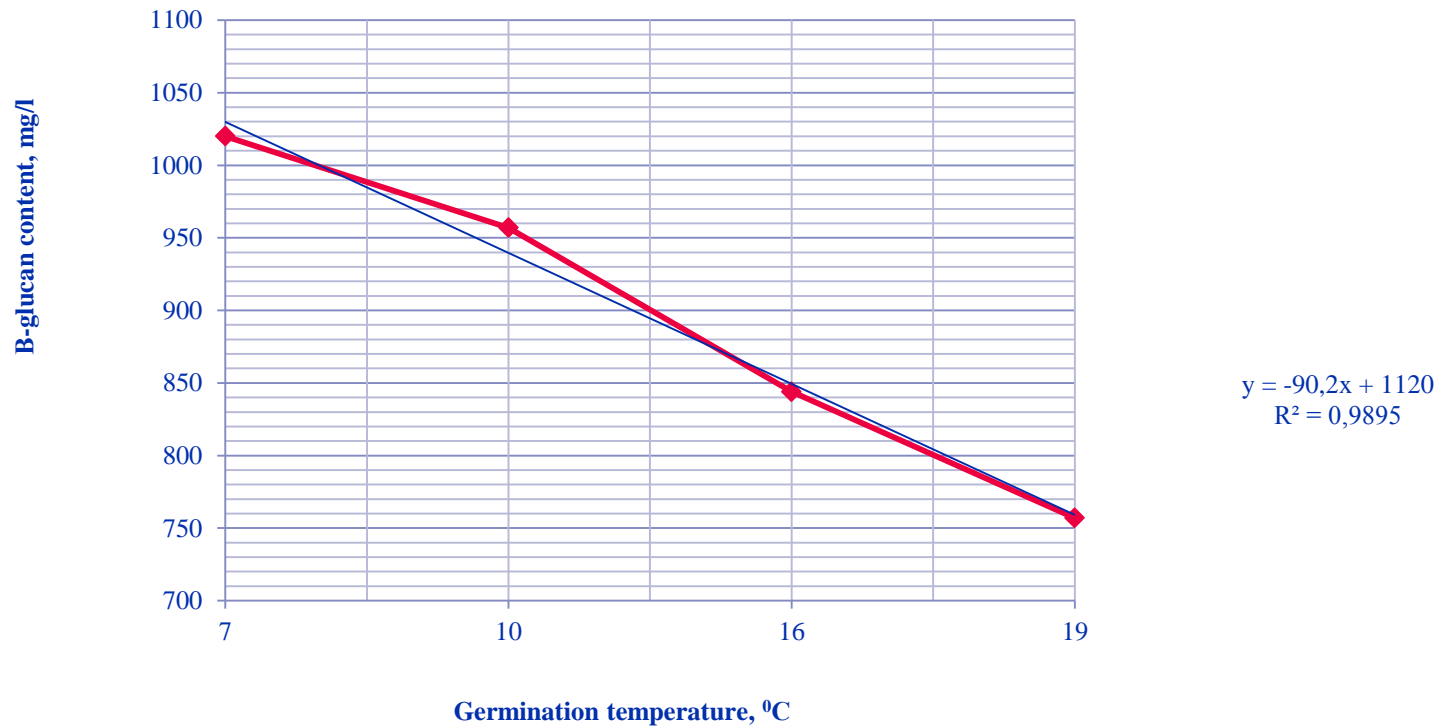


*Table 1*  
**Indicators of cytolytic dissolution of malt**

Indicators	Vyatsky oat malt					Industrial oat malt manufactured by Castle Malting
	Mode of germination					
	1	2	3	4	5	
Difference in mass fractions of extractions from fine and coarse grinds, $\Delta E$ , %	-19,8*	-	-	-10,1*	-9,2*	-11,5*
$\beta$ - glucan content in the congress wort, mg/l	1020	723	844	757	732	535
pH	6,07	6,02	5,85	5,78	5,72	5,39
Transparency of wort, (visually)	opalescent					
Mash filtration rate, min.	more 60					
The length of germinal leaf from the grain length	-	appeared	1/2	3/4	3/4	-

\*mass fraction of fine grinding extract is less than a mass fraction of coarse extract

«-» no data,  $p \leq 0,10$



**Pic. 2. The influence of grain germination temperature on the content of  $\beta$ -glucan in the Vyatsky oat malt (3 days of germination)**

*Table 2*
**Indicators of proteolytic dissolution of malt**

Indicators	Vyatsky oat malt					Industrial oat malt manufactured by Castle Malting
	Mode of germination					
	1	2	3	4	5	
Mass fraction of malt proteins, %	13,09	13,08	13,10	13,10	13,30	15,60
Soluble nitrogen, mg/ l	155	250	363	532	555	505
Kolbah number, %	14,1	16,5	21,7	28,0	30,5	21,5
Amino-free nitrogen (FAN), mg/ l	34	55	80	117	122	111
Hartong number, %	-	19,9	21,7	26,1	27,6	33,2
Wort colour before boiling, EBC	1,9	1,9	1,9	1,9	1,9	5,2

- no data,  $p \leq 0,10$

*Table 3*  
**Indicators of amyolytic dissolution of malt**

Indicators	Vyatsky oat malt					Industrial oat malt manufactured by Castle Malting
	Mode of germination					
	1	2	3	4	5	
Mass fraction of extractives in the coarse grind, %*	57,1	60,4	71,7	74,5	76,5	79,4
The duration of saccharification, min	not saccharifying					

\* - for the mass fraction of extractives was taken extract from coarse grind



Thus, it was found that an increase in the duration of germination up to 4 days at 18-19 ° C leads to further accumulation of the enzymatic activity of oat malt, but is impractical in terms of intensification of production. For producing of malt from Vyatsky naked oats a three-day grain germination under the temperature of 18-19 ° C is enough. The resulting product is referred to a group of short germination malt;



*Table 4*

**The carbohydrate syrup composition from Vyatsky naked oat malt and industrial oat malt CHATEAU OUT %(|p|≤ 0,10)**

<b>Sample of syrup</b>	<b>DP4+ (dextrans)</b>	<b>DP3 (maltotriose)</b>	<b>DP2 (maltose)</b>	<b>Glucose</b>	<b>Fructose</b>
№1 Syrup from Vyatsky short germination malt	19,963	7,330	61,165	10,929	0,613
№2 Syrup from oat malt manufactured by Castle Malting	16,476	7,367	62,127	13,086	0,944

✓sugar ratio of glucose: maltose: maltotriose: dextrin for syrup from Vyatsky oat malt is 1: 5.6: 0.7: 1.8, for the syrup from malt CHATEAU OUT 1: 4.7: 0.6: 1.3. Syrups have a high content of maltose and low content of glucose, this means syrups have less sweetness and can be recommended for the production of curative nutrition.

Table 5

**Physico-chemical characteristics of syrups from Vyatsky naked oat malt and industrial oat malt  
CHATEAU OUT**

	Syrup from Vyatsky short germination malt	Syrup from oat malt manufactured by Castle Malting
Pentosans, (w %)	1,99 ± 0,20	4,40 ± 0,44
Ratio of xylose/ arabinose, (w %)	5:6	7:4
β- glucan , (w %)	2,99 ± 0,15	1,20 ± 0,06
Vitamin:		
Vitamin B <sub>1</sub> , μg	5,0	2,8
Vitamin B <sub>2</sub> , μg	2,2	1,3
Vitamin B <sub>3</sub> (PP) , μg	0,1	0,26